THE AMERICAN SCHOOL AND UNIVERSITY

A YEARBOOK DEVOTED TO THE DESIGN, CONSTRUCTION, EQUIPMENT, UTILIZATION, AND MAINTENANCE OF EDUCATIONAL BUILDINGS AND GROUNDS

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Foreword

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EDUCATION becomes increasingly a science. At least this is true of that part of the process carried on in our schools and colleges. In no other phase of the educational program is this as evident as it is in reference to the school plant. Some of the best thought within and without the profession has been devoted to school buildings and grounds and their proper equipment. I had not realized that fact fully before reading many of the contributions in this yearbook. With all of this expert information available, there is little excuse for any community to approach the building and equipping of its school plant in a haphazard manner, nor for the failure properly to care for it after it has been established. It would be very satisfying if we were sure that the educational program and its objectives had been as efficiently and scientifically developed as has the school plant.

AFTER all, buildings and grounds and their equipment are means to an end and not an end in themselves. They serve, and therefore must not dictate, the educative procedures and activities. Those who are responsible for planning and constructing our school plants must be able to anticipate changes that may come in educational philosophy and procedures a half-century in the future. Many of our present buildings were constructed more than a half-century ago. To what extent did those who planned them restrict the schools of today? For instance, what effect did the small playgrounds provided generally in connection with the schools have on retarding or shaping the development of our program of physical education?

AS I asked myself these and many other questions like them, I wondered to what extent the school plants we are building today will hamper the educational program of the year 2000. The articles in this yearbook are reassuring evidence that the leading thinkers in this field are aware of their responsibility. The authors speak of planning for the future, of the necessity of building a school plant to serve the educational program, and one that can be adapted to changing needs. They are essentially educators who know the problems of education. They conceive the school plant as designed and operated to promote the efficiency of the instructional program, whether in

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the classroom, laboratory, shop, auditorium, library, cafeteria, corridors, or on the playground. Even the heating plant and the lighting and ventilation are conceived with the same objective in mind.

WHEN one considers the school building constructed fifty years ago, the architectural improvements reflected in this yearbook are very pleasing. The care and maintenance of the buildings and grounds has been elevated to a high standard and established on a scientific basis. It is very encouraging to note the emphasis on beautifying the grounds. Even playground space can be made attractive. School landscaping is coming into its own. The school need no longer be an ugly place, as so many of them are.

SOME of the greatest dangers to progress in education are the vested interests and the necessity of fitting the program to physical plants in existence. Possibly the greatest contribution of THE AMERICAN SCHOOL AND UNIVERSITY is towards the elimination of these menacing factors. Here is an opportunity for free play in the imaginative thinking of our architects, but, in close contact therewith, is presented the educational need; equipment of all kinds is presented, but in keen competition to serve the program of education; the philosophy of one educator is checked against another; experiments are encouraged and appraised; radical thinking is contrasted with the conservative, and neither determines the course of the schools. But, most of all, here is a medium through which there can be encouraged constant study and appraisal of the educational needs of society and the adaptation of the school plant to meet those needs. It encourages planning in reference to our problems, and both the present and the future are safer in the hands of those who plan.

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Section I

PROBLEMS OF PLANNING AND FINANCE

State Planning Boards Study School Planning and Finance

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PLANNING the public school plant and system in the United States has ceased to be entirely a local responsibility, as evidenced by recent studies made by state planning boards and summarized in the 1935 report issued by the National Resources Committee under the title, "State Planning—A Review of Activities and Progress."* These boards have taken account of the social implications in the present financial condition of school systems, and the uncertainty of their future. Tax systems, as they affect school revenues, have also been studied.

State planning boards have been established in all but two states since late in 1933, and 32 of these are statutory boards. At that time, the National Planning Board, predecessor of the National Resources Board and the National Resources Committee, suggested to the Governors of the states the possible desirability of undertaking state planning work for the purpose of maintaining a continuous systematic study of the state's resources and coordinating the work of various governmental agencies in their planning for the conservation, development and utilization of these resources. If the Governor agreed to appoint a State Planning Board and gave certain assurances concerning office space, staff, sponsorship and continuity, the National Planning Board and its successors extended assistance and cooperation to the states and offered the services of a planning consultant on a part time basis. To date 40 of the 46 states have availed themselves of this opportunity for assistance.

In addition to such basic studies as population, natural resources, land utilization, transportation and public works, a wide variety of inquiries and studies have been undertaken by state planning boards. They have focused attention upon the needs of the public school system of their respective states because of the serious problems confronting educational authorities. In general the approach of the state planning boards to the problem of planning the school system has first been to consider broadly the entire educational system in relation to past and probable future physical, social and economic trends. Current basic studies of the types mentioned above provided an excellent foundation for such a study. More specifically, state planning boards have sought to find answers to questions such as:

1. How many children will there be in the different school age groups in the next few years?
2. Where will these children live?
3. What will be the future educational needs, what kinds of buildings and equipment will be required to meet them, and where should the buildings be located?
4. How do present facilities compare with future requirements and what will be the cost of financing the system?
5. What revenues will be needed to finance the construction of these facilities, and how should they be obtained?

Population Trends

During the depression, the financial burden of supporting school districts has been shifted often to the state as a result of the demands for governmental efficiency and economy and the alarming drops in tax revenues ordinarily available for all services. Of perhaps greater importance has been the fact that the extreme mobility of population and changes in the composition of age groups have caused continuous changes in population distribution patterns, with unfavorable effects upon the stability of autonomous school districts in various sections of the country.

Some idea of the trend in change of composition of population age groups may be gained from the studies and estimates of future population made in 1934 for the National Resources Board by Thompson and Whelpton of the Scripps Foundation for Research in Population Problems.[1] These studies indicated, for the nation as a whole, that while in 1930, 40 per cent of the population

* 310 pages, illustrated; for sale by the Superintendent of Documents, Washington, D. C.; 75 cents (paper cover).

[1] "Estimates of Future Population by States," a series of tables prepared for the National Resources Board, December, 1934, by Warren Thompson and P. K. Whelpton of the Scripps Foundation for Research in Population Problems.

was under 20 years of age, by 1950 approximately only 30 per cent and by 1960 about 25 per cent of the population would be under 20 years of age. Considering only the age groups between 0 and 14 years, 29 per cent of the total population comprised this group in 1930, and it is estimated this will decrease to about 21 per cent by 1960. The studies further revealed that if past trends continue, the urban population (living in cities and villages of 2,500 or more) would be 58.4 per cent of the total population by 1950, and 59.2 per cent by 1960, compared with 56 per cent in 1930.

Studies by some state planning boards, while confirming the Thompson and Whelpton forecasts of a decreasing percentage of the future population in the school age group, also pointed to the likelihood of a decreasing demand for additional school facilities during the next two or three decades. On the other hand, it has been noted that this tendency might, to some degree, be offset by the possibility that child labor laws, technological improvements and the desire for higher education may result in school attendance by a larger proportion of persons in this age group than in the past.

The state planning boards are also giving attention to the importance of adult education, as indicated in a report from the Kansas Board:

"With the advancement of machine production, authorities predict a permanent unemployment situation involving 4 or 5 million persons. In addition to this, a shorter day points to an expansion of leisure time. Provision for this expanded leisure will render necessary a great increase in recreation facilities and an opportunity for study. The loss of morale, due to idleness, leads easily into delinquency and crime. General support by the state of an adequate program of adult education is, therefore, of great urgency."

Methods of Study

In addition to studies of population trends, composition and distribution, the state planning boards undertook thorough surveys and examination of official records to assemble, correlate and present by text, maps and charts the types of available data which would aid toward a better and more general understanding of the pressing problems confronting school authorities as well as other public officials. Obviously, this step must be taken before any sound planning can be done for such expansion or readjustments as may be found necessary. A brief reference to the studies, reports and findings of a few of the state planning boards will suffice to indicate their scope, character, and methods used as well as the difficulties encountered.

Kansas State Planning Board

The Kansas State Planning Board is undertaking to "determine the extent to which education is a state or local function, to achieve better adjustments of inequalities which arise both in taxation and in educational opportunity, due to the unequal distribution of children, property values, and school districts." It is also making a study of present training requirements for teachers with a view to raising the minimum qualifications. The Board is of the opinion that the taxpayers generally complain not so much of the excessive cost of public education as of the ineffectiveness of the expenditures for it. In its studies the State Planning Board has set up three objectives:

1. Gathering all available data relating to the school problem.

2. Correlating and preparing such data in such a way that the public may easily understand them.

3. Disseminating the data so that those who pay for the costs of education and those who enjoy the benefits of it may have a better understanding of the ends to be achieved and the problems to be met.

In November, 1934, the Kansas State Planning Board, using relief labor, undertook a survey of the physical condition of school buildings and grounds in cities of the third class and in the rural districts to supplement studies that had been made previously of their fiscal status.[2] This information was not otherwise available and the project had the approval and support of the State Superintendent of Public Instruction.

The Kansas survey covered 8,217 school districts. In general, questionnaires were used to obtain the following information: the type, capacity, and enrolment in the school; the area of the grounds about it, the recreational equipment, and the supervision of recreation; the type of building, its construction, and its condition; an inspection of the heating and ventilating equipment; and the water supplies and sanitary facilities. The questionnaire was supplemented by rough sketches of the site.

Interesting and practical results were obtained from this survey and the data were very useful in developing work relief projects in the different counties. The Board found that the deficiencies in recreational equipment for the Kansas schools surveyed could be remedied at very low material cost. The report recommended that swings, teeter-totters and other simple recreational apparatus might be built with the aid of relief labor.

However, the survey revealed that about half the buildings inspected had been built before 1900, and over half of the buildings were rated as not better than "fair" in condition. The water-supply systems and sanitary facilities in the schools were not exceptionally good. About 16.5 per cent of the schools still hauled their drinking water, only 12.2 per cent had indoor toilet facilities, and 86 per cent still used the old-fashioned outdoor privies. The report indicated that only about 18.5 per cent of the school grounds were completely fenced, many schools had playground apparatus

[2] For a report of this survey, see "Rural Schools in Kansas," Kansas State Planning Board, Topeka, March, 1935.

in close proximity to the roads, and that in general the arrangement of school grounds, as disclosed by sketches submitted, was very poor.

The detailed information of this character for each of the 105 counties in the state was laid before the Supervisor of Engineering of the Kansas Emergency Relief Committee. Through his office it was transmitted to the local County Poor Commissioners with the suggestion that they cooperate with the County School Superintendents in organizing work projects to improve the conditions disclosed.

Tennessee State Planning Commission

In Tennessee a preliminary survey was made of physical equipment of the elementary schools[3] throughout the state, although data on high schools were reported by many of the County Superintendents of Schools. Of the 6,151 elementary schools in the state, approximately 5,772 were classed as rural, and the study involved largely the latter. For the year ending June, 1934, there were 342,295 pupils enrolled in these schools and the current expenditures for them amounted to approximately $7,563,223.

The aim of the study in Tennessee was to present the facts as they appeared from the records; to show the financial ability of the various political subdivisions of the state; the total investments in physical property per county; the investment per pupil enrolled, and the comparative standing of each county with the state average; the condition of the buildings and the estimated cost of rehabilitating them; the possibilities of consolidation of school plants and districts and other pertinent information.

The data were compiled from reports already made by statutory agencies. No attempts were made to recommend any changes or consolidations, since it was felt this phase of the work could be covered in a separate report and thus avoid delay in making the survey data available.

As the report stated, its purpose was to present "primarily a picture of conditions as they really exist in Tennessee as to the physical equipment of the educational plants of the elementary schools, with estimates furnished by properly delegated officials as to the approximate amount of money needed to rehabilitate such system and put it on a standardized basis of efficiency."

The report which is to follow the preliminary Tennessee report is intended to cover the school system on the following basis: (1) legal provisions for financing schools of the state; (2) training and certification of teaching personnel; (3) statistical studies and interpretation of physical administration of the educational system; and (4) recommendatory suggestions for greater efficiency in educational matters.

[3] "Preliminary Survey of the Physical Equipment of the Schools of Tennessee"; Tennessee State Planning Commission, June 20, 1935.

Ohio State Planning Board

In Ohio, according to the reports of the State Planning Board, approximately 19 per cent of the total capital expenditures of the state and its subdivisions are devoted to the development of the educational system.[4] Generally, the largest proportion of taxes levied by local subdivisions in Ohio are used to defray the fixed charges and operating expenses of the school districts. In some Ohio communities the cost of education is as high as, or higher than, the aggregate cost of all other public services furnished by the community. One of the outstanding fiscal problems of the state is that of finding revenue to aid the great majority of school districts unable to meet fixed charges or operating expenses.

Primarily to obtain an approximate estimate of the school-building requirements of the 2,007 Ohio school districts as a part of the effort to develop a public works program, questionnaires were directed by the Ohio State Planning Board, through the State Department of Education, to the superintendents of schools in all counties, cities, and exempted villages in the state. Returns from these questionnaires were received from 225 of the 251 school superintendents in the state.

An analysis of the returns indicated that about 52.5 per cent of the school buildings, housing about 25.9 per cent of the school pupils in the state, were built before 1900. When the information furnished on these questionnaires was further analyzed, an appraisal by local authorities showed that the costs for new school buildings and additions to or remodeling of the old ones, within the next five or ten years, would be about $64,000,000, representing a school capacity for about 194,270 pupils. On the basis of average yearly capital expenditures during the last three years, it was estimated that such a sum would represent a four-year building program.

The Ohio Board, convinced that the conditions indicated by other preliminary surveys were due largely to the uncontrolled, unplanned, haphazard development of school-building facilities, initiated studies in the field of school-plant planning in cooperation with the Bureau of Educational Research at Ohio State University and the State Department of Education. One of these studies included a survey of existing physical elements which entered into the general state-wide plan of the educational system. The other was a series of type-studies for the planning of school-building facilities in half-a-dozen counties of different physical and social characteristics.

The type studies were initiated in six counties (Hamilton, Carroll, Belmont, Gallia, Logan and Drake) selected principally because of their different characteristics, modified to some extent by the ability and willingness of the local educational

[4] "Preliminary Report on a Series of State Planning Studies," Ohio State Planning Board, August 15, 1934; Chapter VIII, "Report on State Planning During the Period of August, 1934, to March, 1935," Ohio State Planning Board, March, 1935, pp. 292-5.

authorities to cooperate in such a study. It was suggested to these counties that the following information be compiled:

1. County maps showing boundaries of each school district and location of each school; also showing all roads.
2. A map showing the residence location of each child between the ages of six to seventeen, inclusive, in each district.
3. Certain information for each school with regard to the building, its condition and the enrolment to be obtained from a questionnaire.
4. Data for each school district in the county showing the present assessed valuation, tax levy divided as to school, county, township, village, state, etc.

These studies, which are still in progress, are then to be analyzed and coordinated in the offices of the Board to discover the relationships existing between the development of the school plants in various counties and the existing social, economic and physical conditions.

Studies by Other Boards

Studies similar to those noted above, made by other state planning boards, pointed to the need for some reorganization of the present school system, and particularly for the consolidation of school districts in the interests of governmental economy and efficiency of operation. Especially is such consolidation needed in rural agricultural counties which are sparsely populated or where the land is definitely submarginal. It was found that in those rural counties where the soil had relatively little or no agricultural value, four things occurred simultaneously:

1. Improper land use.
2. High cost per capita of governmental services.
3. Tax delinquency of a greater proportion than the general average in other counties in the state.
4. The most pressing school problems.

"Excessive cost of adequate school services in sparsely settled and poor townships presents still another problem," reports the New Jersey State Planning Board. "In some instances the cost of maintaining schools and roads is greatly in excess of the maximum tax revenue collectible." A special study is being made by the Board to determine (1) those areas dependent upon state and county subsidy for these services, and (2) the degree of their dependency. It may be possible that a varying degree of relief may be obtained by school consolidation and purchase by the state of submarginal areas.

Commenting on a reorganization of the educational system in Pennsylvania, the State Planning Board there says: "It seems obvious that the reorganization of our present system into larger local units of school administration and a complete revision of our state-aid policy are imperative. Other proposals submitted in this report are largely dependent upon these adjustments as first and basic steps. Through them Pennsylvania can secure for itself a better educational service at the same cost or an equivalent service at a lower cost." Expenditures and taxation data would furnish material for considerable research, the Board believes.

A reorganization proposal by the Arkansas State Planning Board already is being put into effect. The Board says: "On the basis of the number of children affected, the proposed consolidation program is 60 per cent complete. Of course, after the consolidations are made, the setting-up of the new school program still lies ahead. This is a work that can be fairly well completed only within a period of three or four years. There are but few communities, however, that have not already been affected by the program within recent months. Its continuation will depend largely upon the future action of the State Legislature."

Consolidation—Pro and Con

While the consolidating of school districts tends to relieve conditions in problem districts, plans must be made to prevent any further settlement of submarginal areas. Settlers in these areas, because of the usually isolated character of their settlement, impose a burden upon school authorities for providing education for their children. In New York, the State Planning Board found that in the submarginal farm areas, the average cost per pupil for maintaining one-teacher schools was $162, while for one-teacher schools outside the submarginal areas, it was but $92. In some of these submarginal areas, the state pays about 87 per cent of the school costs. The New York State Planning Board has, along with many other state planning agencies, recommended purchase of the submarginal areas for reforestation purposes.

However, the Kansas State Planning Board has in its report sounded a warning against the overzealous consolidation and reorganization of rural school districts with the observation that: "The rural school, to a considerable extent, serves the double purpose of an educational institution and a community center. In rural regions it is the unit of government to which the citizen has his closest relationship. Here he finds opportunity for exercise of the functions of leadership and, more often than not, gets his first experience with democracy. While the need for consolidation and reorganization of one-teacher districts is obvious, and while the single purpose of affording every boy and girl an educational opportunity must be guarded as the objective, the virtues of the school district as a laboratory of social and governmental experience must not be forgotten."

Our school systems have developed largely through local initiative and might be cited as more nearly the result of a process of natural social development than the schools of any other country. As a result, their maintenance has been regarded as a local responsibility, and would un-

doubtedly continue to be so regarded, were it not for the fact that all geographic regions of the nation have not developed equally. Consequently, all these regions do not have the same social and economic characteristics.

Taxation

Consolidation of school districts to lighten the burdens of problem districts involves careful consideration of financial obligations for other community services in their relation to the public school system. Excepting gifts, tuition, fees and rentals, revenues required for all current expense and capital investment must be raised ultimately by local, state or Federal taxation, even though the immediate sources may be either from taxation or borrowing. While the school district is generally a separate and distinct corporation, the sources of school revenue are largely the same from which income for other public services in the same community is secured. In the United States this source has been predominantly through assessments upon real property, although more recently there has been a tendency in some states to resort also to the income tax, the sales tax and other forms of taxation.

Many local governmental units, organized to meet the requirements of a rural population before modern means of transportation and communication were developed, have not kept pace with rapidly changing social and economic conditions. Improved highways and transport facilities, the telephone, and the radio have shrunk old boundaries to a fraction of their former extent. Industrial and scientific progress, with resulting higher standard of living, has compelled these units to undertake new and costly public services in the fields of health, welfare and, particularly, education. These services require an increasing rather than a decreasing area and support for their successful administration. Many of these units are losing in population and wealth so that the burden of providing and maintaining these new services is doubly onerous. Others are growing in population and wealth until the existing units of government are no longer suitable for effective and economic management.

The necessity of the revision of the local and state taxing systems is made very clear in the studies of the North Dakota State Planning Board. The Board reported that the farmers of North Dakota in 1931 produced farm crops valued at $52,507,000, which was only 62 per cent of the value of their crops of the preceding year. The tax burden payable in 1931 was $37,327,227. In other words, 71 per cent of the total value of all crops raised in 1931 was required for the payment of taxes and special assessment. The Board further reported that the assessed valuation of all property in North Dakota decreased from $1,332,163,449 in 1925 to $1,135,053,176 in 1932, or a decrease of $197,110,273. Therefore, the Board pointed out that the maximum amount that can be raised in local taxation decreased $1,722,615, owing to the drop in the taxable valuation of property.

Conclusions

From reports of the state planning boards and special reports which have been made to the National Resources Committee and its predecessors, the National Planning Board and the National Resources Board, several conclusions suggest themselves:

1. Large capital expenditures for school plant and equipment should not be permitted to continue without broad and comprehensive planning. Many local subdivisions must recognize that their probable future growth may justify little if any further capital expenditures in the immediate future for *expansion* of their school systems. Future expenditures for school-building facilities must be expected to be in proportion to capital expenditures for other public works and needed governmental facilities.

Arthur D. Gayer, in a study made for the National Planning Board, estimated that previous to the depression, the annual outlay for educational buildings was about $400,000,000, and, next to capital outlays for roads and bridges, represented the largest single item of public works expenditures.[5] During these years, the capital expenditures for educational facilities were between 23 and 25 per cent of the total expenditures for public works. What such expenditures may be in the future is questionable. The influence of population trends on the side of lower capital expenditures may be offset by the demands for additional facilities imposed by child labor laws, technological improvements and higher educational standards.

2. In many cases school districts must be consolidated in order to reduce expenditures, in the public interests of economy and efficiency of operation. Antiquated schools must be scrapped, and in regions of submarginal land and low standard of living, families should be encouraged to move to lands of better quality where they can support themselves, and where their children will be given the opportunity to enjoy an adequate standard of education.

3. Public finance systems in many communities must be revised or local taxing units will be unable in the future to meet the full obligation of their various public services, including the school system. School authorities must expect to make the necessary readjustments, in addition to district consolidations, to permit them to operate within their fair share of available public funds. In this crisis, state governments may be expected

[5] "Public Works in Prosperity and Depression," by Arthur D. Gayer; National Bureau of Economical Research, New York, 1935. See also "Criteria and Planning for Public Works," by Russell V. Black; National Planning Board, June, 1934.

to assume a larger share of the burden for maintaining the school system because of their broader taxing power.

4. Of necessity, the planning activities of educational authorities must be more closely integrated with the work of state and local planning boards. State planning boards already have taken steps in this direction through their close cooperation with state departments of education and local school authorities.

School locations and requirements should be determined in accordance with the state, county and city plan and the various studies by planning agencies in those areas. It is being recognized more and more that the location and design of schools depend upon surrounding conditions, present and probable future trends of population and land utilization, highway and street design, and regional planning considerations which might invalidate unrelated local school planning efforts.

For example, it would be extremely shortsighted to locate and build a school on a highway which will be soon re-located according to a state or regional highway plan, or to plan educational facilities for an area which is to be purchased for reforestation or may be inundated in a reservoir to be constructed for water conservation.

Progress will be accelerated when all persons involved in the planning, maintenance, and support of our educational system recognize and appreciate the advantages that accrue from the long-range planning of this great public service in relation to all other community services.

That greater social demands than ever before are being made of education, is emphasized in a report of the Oregon State Planning Council, which says: "Up to the present moment our civilization has demanded of education the equipment of the individual with certain skills or techniques, or the possession of certain bodies of information. In view of the uncertain future confronting young and old alike, education ought conceivably to provide the individual with ideals and attitudes to enable him to live a satisfactory existence with a certain degree of independence of the processes by which he keeps himself alive."

County versus Municipality and Township as a School Administrative Unit

BY N. E. VILES

DIRECTOR OF SCHOOL BUILDING SERVICE, STATE DEPARTMENT OF PUBLIC SCHOOLS OF MISSOURI

in cooperation with

CHARLES A. LEE

FORMER STATE SUPERINTENDENT OF PUBLIC SCHOOLS OF MISSOURI

THE local rural school districts were organized as administrative school units early in the history of the American public school system. These districts were usually so small that the schoolhouse or school center was within walking distance of all the children. In a number of states there has been an actual increase in the number of small rural districts during the last 25 years. Some of the state laws still require that a school be maintained within 2½ miles of all pupils if transportation facilities are not provided. A large part of the rural area is still divided up into small administrative school units.

Many years ago the town and city school districts found it to their advantage to unite several small school units into one administrative district for all of the town. The need for the enlarged units became apparent in the town districts as the cities grew and as the administration of the schools in small units became more difficult. In the city and in the rural areas the development of high schools also helped to create a demand for larger administrative units. The small units did not have enough pupils of high-school age to organize a satisfactory high school. The methods set up for financing the early one-room school district were not adequate for the high-school district, and consolidation of units became desirable. This consolidation was effected in many instances by combining several of the smaller units into one enlarged district.

Thus there gradually came a realization that larger school administrative units were desirable, not only for the high school but for the elementary schools as well. However, the change did not come rapidly. There was a reluctance on the part of the people to give up the local district. Certain favored districts were not willing to share their taxing power with the poorer districts. The city districts were not willing to annex rural territory unless tax rates in the territory thus acquired were raised above that previously paid by the rural district. Several plans have been proposed to foster the development of larger administrative units. Each of these plans has had some following and some merit, but none has been universally accepted.

The County Unit

One of the first plans developed for the enlarged administrative district was the county unit. There were probably two reasons why the county was accepted as a unit in some states:

1. The county had become an accepted governmental unit of the state. The people had become accustomed to county government, and looked upon the county as the immediate center of their local government. Counties were usually laid out in units small enough for all residents of the county to have access to the county-seat town.

2. In many cases a county school supervisor had been elected or appointed. It seemed natural for these supervisors to promote the county unit plan.

The county units vary in the degree of centralization. Some of them, where the county board has much authority in the management of the school, might be termed strong county units. In some cases the county board selects the county school superintendent, who recommends the teachers, adopts the textbooks, supervises the erection of school buildings, and makes all the rules and regulations for the schools of the county.

In other counties a weak type of the county unit plan has been developed. In these counties the county boards perform only one or two of the duties listed in the previous paragraph. In a majority of the states that have a county unit system certain districts are exempted from county control. In these states the county unit plan aids in setting up a dual system—one part for rural areas, and one part for exempted districts. Only a few states or counties have what might be termed a complete county unit system.

ADVANTAGES

Some of the advantages of the county as the administrative unit are:

1. The larger unit makes it possible to distribute the tax load throughout the county.

2. There is a possible economy in county purchases of supplies and equipment.

3. The larger area brings together a larger number of pupils under one jurisdiction, and thus makes it possible to eliminate some uneconomical school units.

4. The county unit organizes school control into units comparable to other county activities (which may or may not be advisable).

5. The county unit makes it possible to use the county school superintendent and the county board which are already set up as administrative forces in some of the states.

6. There are usually a sufficient number of children to provide satisfactory transportation units.

7. A larger number of children makes it possible to provide better-graded schools.

8. A much broader and richer educational program can be provided with the larger number of children.

DISADVANTAGES

The county administrative unit also brings a number of difficulties that have not been eliminated in all the states:

1. The city districts have in many instances been set apart from the county. In some districts pupils living just outside the city limits may be compelled to go away from the city to county schools, even though their interests may lie in the city.

2. The county unit does not necessarily tie the schools up around any social or trading center where the people are accustomed to meet.

3. The county unit may split districts by fixed lines which have little or no relation to the needs or location of the children. An illustration taken from Missouri shows this to be true. In Missouri there are about 1,000 high-school districts. Almost one-fourth of these districts extend across the county lines. Many pupils who do not live in the districts mentioned above now cross county lines and pay tuition to attend high school in another county. A study of the location of tuition pupils indicates that the local high schools draw from an area that is not limited by county lines, and that county lines are not the logical boundaries for all school districts.

4. A tie-up with the county organization may bring the schools into contact with county politics to the disadvantage of the schools.

5. The county unit is often too large a supervisory unit with the present inadequate facilities available in many of the counties. Teachers should have frequent contact with the supervising principal, and this is not easily obtained where only one supervisory official is available to contact 150 rural teachers, especially if these 150 teachers are scattered over an area of 600 square miles. (Adequate supervisory assistance would eliminate this disadvantage.)

6. The county unit has not done away with the small, inefficient one-room rural school. In many ways it has not met the expectations of those favoring such enlarged units.

7. The county unit is not now considered a large enough unit for taxing purposes. The present demands are for much larger taxing units.

The Municipal or Township School Administrative Units

Recent school surveys have shown recognition of the municipality as a school administrative unit. It is true that some of these surveys have recommended that the county and municipal units be combined, but the value of the municipal unit has been recognized. The first centralized districts were the town and city districts. In recent years there has been a trend toward consolidation of rural districts into central units.

The State Commissioner of Education for New

York* states that the central rural school, which is somewhat similar to the municipal unit, aids in securing better teaching than is found in the one- or two-room rural schools. He also states that the central rural school provides better and more frequent supervision for the teachers than it is possible to provide in the small rural schools. This is especially true in special subjects such as art, health and music. Local control is maintained.

ADVANTAGES

The central municipal districts have several advantages that may be found, but are not inherent, in the county unit districts:

1. The central district is close to the people. Local control is maintained. The people can participate in the control of the schools and can feel that the schools belong to them. Local cooperation is fostered.
2. The local or municipal administrative units may be centered around natural or developed social and/or trading centers to which the people are accustomed to coming.
3. We have become accustomed to school administration by a superintendent selected nonpolitically.
4. Supervisory service and local administration may be better concentrated in the smaller unit.
5. The school may be made a community enterprise and may be the social center of the community.
6. Local interests may be catered to in developing curricular and extra-curricular activities.

DISADVANTAGES

The municipal administrative district may also present a number of disadvantages:

1. Many of the towns and villages are too small to maintain an economical school unit. In many of the local units there are not enough pupils to form a school of the type needed for the pupils of that area. As a consequence, the curriculum offering is restricted and the school is limited in its effect.
2. Many of the small units are not financially able to provide the physical plant facilities needed, or to provide adequate teaching and supervisory facilities. The small high school is probably as inefficient as the small rural school.
3. Many school administrative units require that an adequate county or state supervisory service be set up.

Neither the county nor the municipal unit completely satisfies all the demands of a modern administrative unit. No plan for the development of school administrative units should be considered efficient unless it provides for an adequate basis for supervision, for equal educational opportunities for all children, for an equalization of the tax load, and for some opportunity for expansion beyond the minimum educational offering. Neither the county nor the municipal administrative units can of themselves meet these conditions. It seems probable that we cannot determine the best administrative school unit until we have developed an adequate plan of state and/or national support of our educational program.

With the development of an adequate plan of financing education, it may be desirable to have municipal or community administrative school units centered around logical community and social centers. These units should have enough pupils from grades one to twelve inclusive to form a school that can be administered economically. These units may be formed into supervisory districts. The size of the supervisory districts should be determined by the number of teachers and the accessibility of the school units.

While it is impossible to say which type of unit is best for administrative purposes, there are certain minimum requirements which all districts should meet. The local administrative unit should be large enough to provide sufficient wealth to furnish a satisfactory background for financing that part of the educational cost that must be paid by the local district. It should contain a sufficient number of children to form an economical school unit with the cost of instruction held to a reasonable figure. It should contain sufficient population to provide ample competent lay leadership. These factors are not always secured in the small rural or small municipal unit.

* Twenty-Sixth Annual Report of the Education Department of the State of New York, 1930.

State-wide Planning for School Buildings

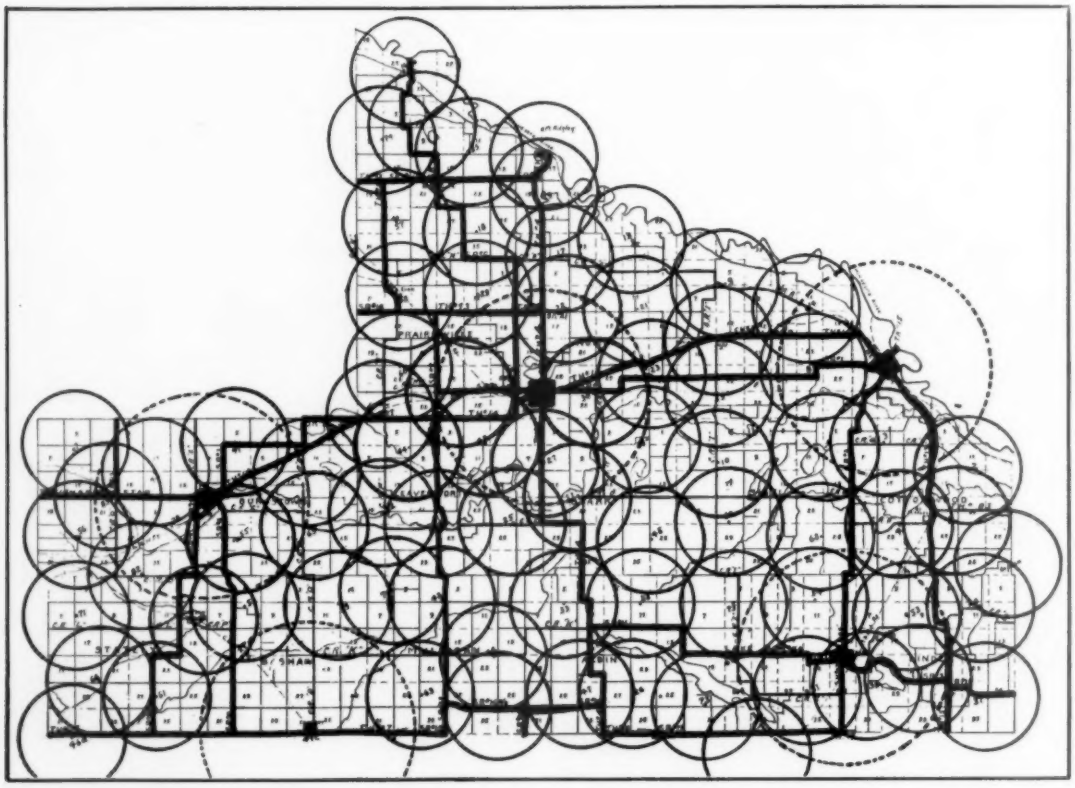
BY FRED ENGELHARDT
UNIVERSITY OF MINNESOTA

THE limitations of local planning of school buildings, except in the very large cities and in densely populated areas, are being manifested more and more as factual approaches to the study of the problems of educational administration are undertaken. State-wide planning for school-building needs is as vital to equality of educational opportunity and to economy as is city-wide planning. Decreases in birth rate, population movements, shifts in productive wealth, affect the location of school children in reference to school-building needs in the state taken as a whole, in a manner quite similar to that known to exist within a city.

Evidence gathered in certain sections of some states indicates that school accommodations are lacking because the schoolhouse facilities are not always located where these facilities are needed most. As is the case in the schools in many cities, there is an excess of pupil stations in the school buildings but the excess is not to be found where population growths have occurred. As local responsibility for planning schoolhouse needs continues, the lack of balance between pupil-station needs and school-building location will no doubt be accentuated, and in time an accumulation of capital expenditures for school plants may be noted that may result in revenue waste because buildings are not used to full capacity.

Problems Are Different in Each State

In studying the problems related to a state-wide plan for school-building development, one must take into consideration the conditions existing in the state under review. In fact, each state has problems that are unique and characteristic, and hence the plans projected relating to school buildings for each area must be developed along lines best suited to that state. State-wide planning for school buildings in New York State or in Pennsylvania would differ in many respects from planning a similar program for the state of Minnesota. The historical background, the



MAP OF A TYPICAL COUNTY IN MINNESOTA, SHOWING OVERLAPPING OF SCHOOLHOUSE SERVICES
Solid circles indicate 2-mile radius of one-room schools; dotted circles, 4-mile radius of town schools

political situation, the existing responsibility of state departments of education, the method of financing buildings, the type of local school districts, the location of population, the outstanding indebtedness, general responsibilities for financing schools, responsibility for highways, and attitudes toward transportation of school children, are some of the many factors that may affect successful planning.

Planning for school-building needs on a state-wide basis will not come about except over a period of years of study and public enlightenment. In all stages of development there will be strong local objection exactly as confronted the movements that initiated school-building planning on a city-wide basis. As the people become familiar with the possibilities latent in state-wide planning, they will appreciate the resulting economy. The factual basis on which plans for schools may be projected, and the consequent improvement in education resulting therefrom, will no doubt win public support as the public becomes enlightened on the subject.

Transportation and School-Plant Planning Associated

As has already been pointed out, transportation must be considered as closely related to the school plant.[1] Transportation is no longer an activity peculiar to certain sections of a state, but it is a basic element in the educational program and must be associated with school-building planning. In contemplating school-housing needs one may choose transportation, the construction of dormitories, or the construction of school buildings, as conditions warrant. One may utilize one or all of these means to serve the ends sought, as conditions, economy and the desired educational service determine choice. The public school dormitory is a new element in schoolhouse planning which is gathering experience and is now being tested out. In local school-building planning, transportation has not been given the place it deserves. In state-wide building, planning, transportation and the dormitory will be important factors in sound educational administration, and as significant as building construction.

Each year as highways and transportation equipment improve, transportation routes for school children are being extended. In northern states bus routes 30 miles in length have been successfully operated throughout the year. From studies made in 48 small secondary schools in Wisconsin and 68 small secondary schools in Minnesota, it was learned that out of 10,759 students, only 5,843, or about one-half, walked to and from school each day; the other children reach school through some means of transportation.[2]

[1] Engelhardt, Fred: "Transportation and the School Plant." *American School Board Journal*, 87: 5. November, 1933, page 28.

[2] Engelhardt, Fred, and Others: "District Organization and Secondary Education." Bulletin 17. National Secondary Survey. United States Office of Education, 1932, p. 30.

State-wide planning for school buildings will require cooperation with highway departments. Great economy and increased local approval of transportation will result if highway planning is projected with proper consideration of current and future school transportation needs. In many sections of the country, reports have been received which reveal most interested responses from the highway authorities when approached in reference to the study of highway needs as they relate to school-building and school-transportation needs. There are cases in which the county highway departments make no road plans without consulting the school officials.

As the problems of school buildings, dormitories, school transportation, and highways are studied together, many interrelated problems are revealed. Many of these have to do with the design and location of the public school dormitory, the school-bus garage, parking facilities about the school buildings, and the recreational fields, as well as giving special consideration to highway approaches to the school plant to insure smooth traffic movement, and also special attention to the attractiveness and general appearance of the school grounds and the approaches made necessary by the automobile and its common use.

The Educational Program and the School District

It is an empty and futile dream that projects equalize educational opportunity within the borders of a state apart from a large school district organization. The small-town school district or the community district will bring about equality of opportunity only at prohibitive expense. The dual system of education that separates the rural child from the urban child must be destroyed, but will always continue with the small school district. Only through large administrative and support units that include farm and city, can equality of opportunity ever come into its own. With adequate building planning for the large local unit of administration, equality of educational service, adequate supervision, and a program of work adapted to the needs of children can be brought to each child, or each child may be brought to the place where the needed school services are to be found.

Factors Leading to State-wide School-Building Planning

As suggested above, each state has its unique problems, and the avenue along which state-wide building planning will move will depend on the conditions in the state considered. It may be well to indicate some of the factors that appear to be leading to the acceptance of the principle that the state must initiate a state-wide building program and control its development if the state's best interests in public education are to be safeguarded. The facts the author of this article has at hand apply to the state of Minnesota and may be of interest to those now directly concerned in

this problem as it applies to the welfare of other states.

Each of the 450 high schools of the state serves an area of less than five miles in radius. The schools average enrolments of less than 200. The state pays the tuition of about a third of the pupils attending the secondary schools (excluding the large centers) at a cost of nearly $1,400,000 a year. Under this plan about one-half of the rural eighth grade graduates attend secondary schools, in contrast to nearly 85 per cent of the corresponding group in towns. If each school was organized to serve an area double that now served, the number of secondary schools would be decreased by almost one-half, the enrolment in each school would approximate 400, a size generally agreed upon as a minimum for an economically operated secondary school rendering satisfactory services to its pupils.[3]

Studies made in various counties of the state reveal building utilization in village and small-town schools that average almost 70 per cent of the available stations in the elementary schools. In the secondary schools it is rare to find the schoolroom used on an average of more than 50 per cent of the time, and the station use in secondary schools is very low, averaging about 38 per cent. To provide laboratories, a gymnasium, a library, and facilities for home economics, industrial arts, and agriculture in a school with an enrolment of less than 400 pupils, results in relatively low percentage of use of these facilities which are procured at large capital outlays.

The distribution of schoolhouses in a typical county is shown in the diagram. Note the overlapping of school facilities. The station use in rural schools averages less than 40 per cent. For a period of years for every one-room school that was abandoned in one section of the state, a new one-room school was constructed in another section of the state. One might suggest that portable schools could be planned and moved about as the need for schools of the one-room type shifted from one section of the state to another.

The six-year high school is rapidly getting under way. Young people entering these schools from the eight-year ungraded rural schools are having difficulties in making adjustments. There is an increasing demand that rural schools operate a six-year school only, and that the state pay the tuition of the seventh and eighth grade pupils who attend the approved six-year high school and come from the open country. To do this will cost the state at least $2,000,000 more each year. Under these plans, if rural children attended secondary schools in the same proportion as the town children, the state would pay about $5,000,000 in tuition. In some of the counties in which school-building use has been studied, it has been shown that excess facilities in towns make it possible to close all the one-room schools in the county. The children attending these schools could be transported to the town schools where there are adequate facilities, and few children would need to travel more than 15 miles on good highways.

The school bonded indebtedness in Minnesota outside the three large cities is about $35,000,000. A large share of this debt is in bonds held by the State School Fund. In the legislative sessions of 1933 the revenue from the income tax was assigned by statute to liquidate school indebtedness. During the past two years slightly less than $3,000,000 was received by all schools from this source. If economic conditions improve to normal, the revenue from the income tax will liquidate the outstanding school bonded debt in less than 25 years. It would pay the state to take over all school bonds and to refund them at lower rates.

One may well question how long the state will pay the bonded debt created by the local school districts, over which the state has had little to say. If the taxpayers of the state are called upon to pay the debt created for school buildings constructed under local authority, there will be a demand that the state have some jurisdiction over school-building planning.

If school-building planning and construction were taken over by the state at the same time that the bonded debt is being liquidated, a considerable economy would result. The complete liquidation of outstanding school debt would provide about $3,000,000 annually, which would be available for other school purposes. If buildings were planned on a state-wide basis, $1,000,000 a year would cover the entire school construction needs, excluding those of the large cities. If the state paid cash for construction, as it might well do, and if the state assumed the responsibility for insurance, another half-million dollars would be saved for more effective use in public education.

In addition to state planning for buildings, the state should take over the entire state public school transportation system. At the present time Minnesota pays about $750,000 toward school transportation. This item of expenditure represents three-fourths of the entire public cost of transportation in consolidated schools. It would be much more economical if the state directed the transportation, purchased and controlled the busses and paid all the expenses.

Steps similar to those implied in the above discussion could be taken in the development of public education in a state without removing from local control those elements of school administration that are essential and vital to local initiative and to school progress. At the same time, greater economy and efficiency in transportation would result, and throughout the state there would be school buildings of a type in which programs of education providing equality of opportunity would become available to all the children of all the people of the state.

[3] Dawson, H. A.: "Satisfactory Local School Units." Peabody College, Nashville, Tennessee, 1934.

Section II

DESIGN AND CONSTRUCTION OF BUILDINGS

Planning the Consolidated School for Maximum Utilization

BY W. K. WILSON

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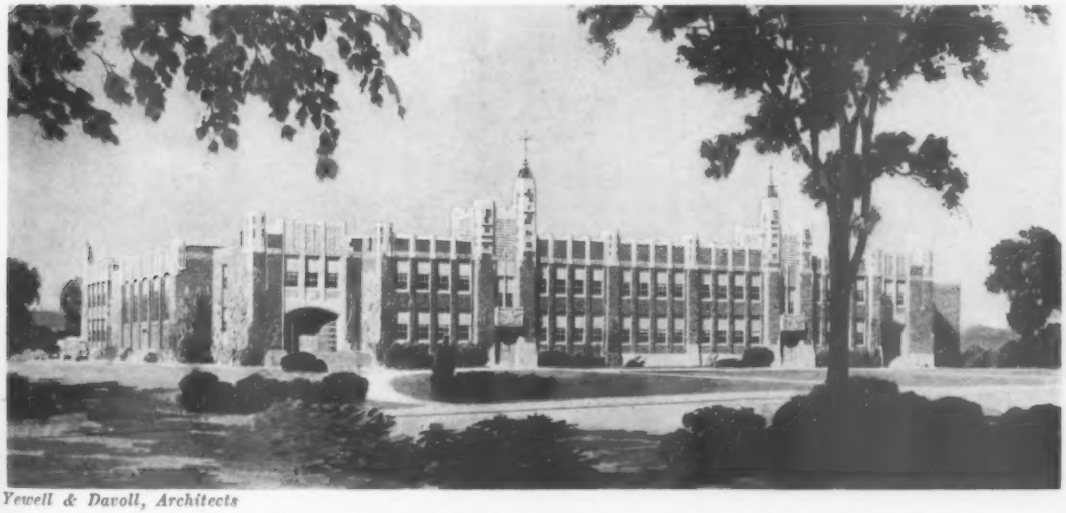
IN any study or discussion of the utilization of a school building, it is generally customary to consider two types of utilization, namely, teacher utilization and pupil utilization. The former is often spoken of as teacher-station utilization and refers to the occupancy of the educational rooms of the building by the teachers for regularly scheduled recitational activities; the latter is frequently spoken of as pupil-station utilization, and refers to the regularly scheduled pupil occupancy of the individual seats, benches, chairs, or spaces set aside for all types of recitational activities engaged in by the pupils.

The measure of the utilization of a building would seem to be a simple task. It involves merely the measurement of actual occupancy, the measurement of capacity, and the derivation of a measure of utilization, usually expressed in per cent, and obtained by dividing the measure of occupancy by the measure of capacity. The formula is simple enough, but its general application is not so simple, because of the widespread differences of opinion as to what constitutes a correct or even reasonable measure, either of occupancy or of capacity.

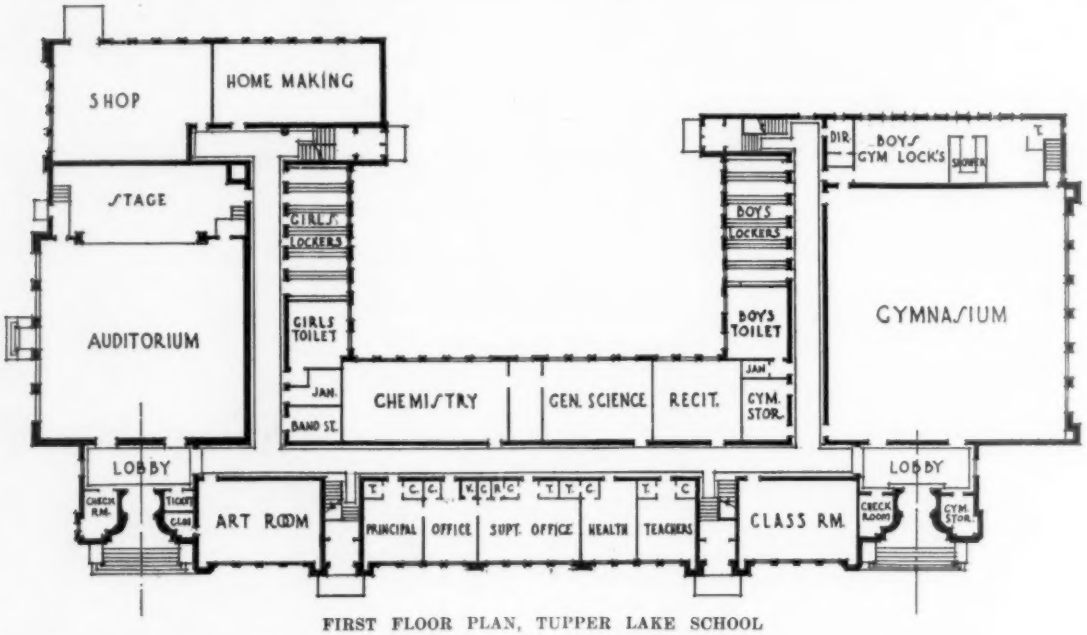
And yet, if we are to plan school buildings for maximum utilization, we must have in mind, as a basis for our planning, some method or standards for measuring both the occupancy and the capacity of the buildings to be planned. Or, to state the proposition differently, we must base our planning upon the principles and underlying assumptions of organization and administration of the schools for which we are planning, to the end that the buildings will yield the highest possible percentage of occupancy without interfering with the efficient operation of the schools housed therein.

What are the more important factors of organization and operation of a high school which affect the occupancy or utilization of the building housing that school? In listing these factors, the typical American high school is considered, with the tacit agreement that there are many types of special and experimental high schools differing widely from the typical in one or more of these



Yewell & Davoll, Architects

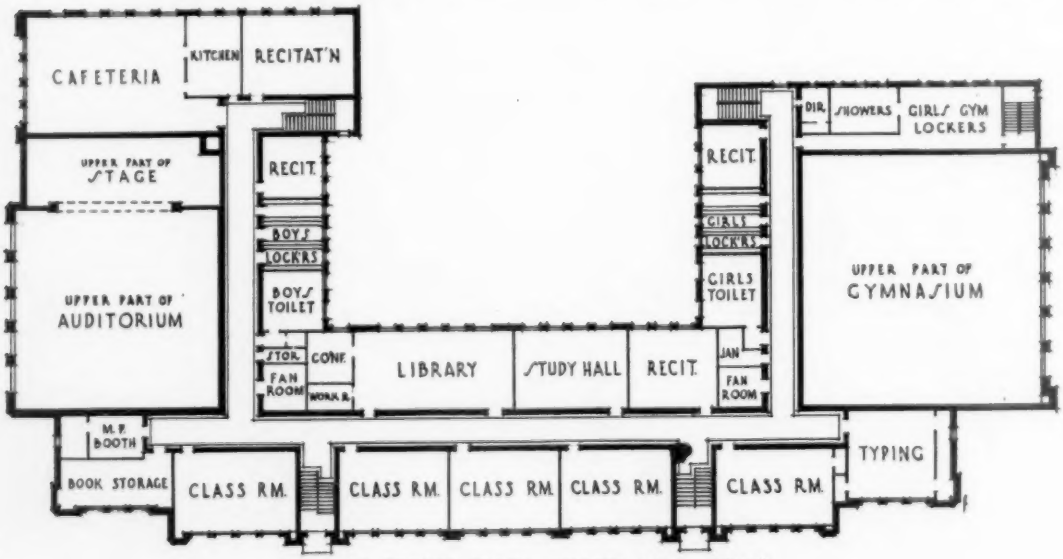
JUNIOR-SENIOR HIGH SCHOOL, TUPPER LAKE CENTRAL RURAL SCHOOL DISTRICT, N. Y.



FIRST FLOOR PLAN, TUPPER LAKE SCHOOL

listed characteristics. General rules for planning must be based upon general characteristics of organization. The *typical* high school is pictured as follows:

1. The subjects taught are divisible roughly into two groups; namely, the special subjects, such as science or homemaking requiring rooms of special design or equipment, and the non-special subjects, such as English or social science.
2. All subjects are taught through the medium of recitation groups, varying in size according to the size of the school and to many other limiting and controlling conditions.
3. Recitations in practically all subjects are conducted once a day, five times a week.
4. For convenience in conducting recitations, the school day is divided into a definite number of recitation periods, varying generally in different schools from 40 to 60 minutes in length.
5. The entire group of daily recitations is arranged into a schedule known as the daily recitation schedule.
6. The typical student "carries" four subjects a year for four years, thereby limiting the



PLAN OF SECOND FLOOR, TUPPER LAKE SCHOOL

number of daily recitations he may engage in.

7. Since the number of daily recitation periods is usually more than the number of daily recitations each pupil is engaged in, it follows that during each period of the day a portion of the student body is engaged in study or other non-recitational activities.

Here we have, then, a picture of the typical American high school "at work." Except during general assembly, each period of the school day the entire student body is divided into smaller groups, some reciting, some studying, and some engaged in extra-curricular activities, or those activities of a socializing nature not directly a part of the recitational work. In general, the number and size of these groups vary directly with the size of the school. Likewise, within a given school the number and size of these groups vary from period to period. The nature of the activities carried on by the different groups varies widely also; some group activities require rooms specially designed and equipped, while others do not.

In order for a building to yield 100 per cent utilization, it would be necessary for each room in the building, and each pupil station in each room, to be occupied every recitation period of the day and every day of the school week. It is evident from the very nature of high-school organization that such occupancy is impossible. Maximum utilization may be defined as the nearest possible approach to continuous occupancy, throughout the recitation schedule, of all teacher-stations and pupil-stations. To be able to plan a building for maximum utilization, it is necessary first to recognize the factors that affect utilization, then determine to what extent those factors limit continuous and total occupancy of a building. From this information we may hope to plan a building wherein the margin between total and possible utilization may be a minimum. The factors affecting utilization may be classed under three general heads; namely, (1) the nature of the educational program, as already described, (2) physical limitations in the size, design, and equipment of classrooms, and (3) standards of educational practice as they affect the setting-up and administering of the daily recitation schedule. A discussion of these factors, under the headings given, is set forth, preceding a description of the steps followed by the School Buildings and Grounds Division of the New York State Education Department in planning high-school buildings for maximum utilization.

The Educational Program

It has been pointed out that in the typical American high school offering a well-rounded program of studies, some of the subjects taught require rooms of special design or equipment, while others may be taught in rooms of standard design and equipment, requiring only that these rooms be of adequate pupil capacity.

In planning a high-school building, then, it is necessary to provide recitation rooms of proper design and equipment for each special subject taught, and sufficient recitation rooms of standard design and equipment to house all the non-special classes. The number of special recitation rooms needed for each subject will depend on the number of daily classes reciting in that subject and the number of recitation periods in the school day. The number of non-special recitation rooms required will approximate closely the number of non-special classes reciting daily, divided by the number of recitation periods.

In addition to rooms for housing all recitations, it is necessary to provide spaces to accommodate all pupils not engaged in recitational activities at any period, or periods, of the day. These pupils may be engaged in physical education activities, club activities, study or any other type of non-recitational assignment. The number and type of such spaces will depend largely upon the administration of the daily program, which is discussed in a later section.

The chief factor affecting pupil-station utilization is the relation of class size to corresponding room capacity. The optimum capacity of all recitation and non-recitation rooms is more closely related to the standards of educational practice and to physical limitations than to the nature of the educational program, and is discussed, therefore, under those two headings.

Physical Limitations of Classrooms

Maximum pupil-station utilization of a building may be obtained only by fitting as closely as possible the room capacities to the class sizes, or vice versa. The regulation of class sizes, especially in small high schools, is not as easy as it might seem to the uninitiated. When the individual recitation schedules of all the pupils are made up to include the required subjects, the necessary related electives and the free electives, it is found that class sizes are pretty well confined within rather narrow limits, regardless of any effort to change them. The only hope, then, for high pupil utilization is to plan recitation rooms with pupil capacities corresponding closely to class sizes. But in small schools, where many classes have enrolments as low as ten or less, it is difficult to do this with our present standards of classroom construction. The average classroom width in modern school buildings is approximately 22 feet. If we consider 16.5 square feet as a reasonable area per pupil-station, a classroom built to accommodate ten pupils would be only 7 feet 6 inches long. A room of such dimensions would be absurd for classroom purposes, although with a class of five reciting therein, it would yield only 50 per cent pupil-station utilization. And yet such a room would meet the statutory regulations of New York State for floor area and cubical content of fresh air!

It is doubtful whether, considering the increased cost of heating, ventilation, proper fenestration, and other structural units in small rooms, it is advisable or economical to construct classrooms of less than 15 feet in length, even though such rooms will decrease materially the maximum possible pupil-station utilization in small high schools. This figure is rather arbitrary; combined with a 22-foot width and a 12-foot ceiling height, it constitutes what is termed a half-unit[1] classroom, according to standards used by the School Buildings and Grounds Division of the New York State Education Department.

High utilization of a high-school building is impossible without dual use of special rooms. This is especially true in schools where the number of daily recitations in a given special subject does not approximate closely the number of periods for which the room designed for that subject is available. This difference can be overcome only by equipping special rooms for dual or multiple use. This is especially true of science rooms, typing rooms, and drawing or art rooms. Sewing rooms in home economics departments may be used for certain types of small classes, as reading classes in the languages or literature classes. It is impracticable, however, to expect much dual use of shops; in some instances mechanical drawing is being taught in one end of a shop, but this is not conducive to clean work in drawing.

Standards of Educational Practice

Research, experience, and tradition have established many standards in our educational practices which in turn affect the utilization of school buildings. Limiting pupils to an average of four recitations a day, together with requirements in the choice of subjects for each year's work, has in New York State developed a very high correlation between the number of daily recitations and the enrolment of a high school. From the statistical analysis of the daily recitation schedules of over 800 high schools with enrolments of 50 to 3,000, it has been possible to derive formulas for predicting the number of total daily classes, and the number of non-special daily classes, that will develop in a high school of given enrolment. For schools of 50 to 400 enrolment these formulas[2] are

$$\text{Non-special classes} = \frac{\text{Enrolment}}{8} + 12$$

and

$$\text{Total classes} = \frac{\text{Enrolment}}{5} + 15$$

while for schools of 400 to 3,000 enrolment, the corresponding formulas are

$$\text{Non-special classes} = \frac{\text{Enrolment}}{10} + 20$$

and

$$\text{Total classes (except physical education)} = \frac{\text{Enrolment}}{7} + 24$$

Educational practices likewise determine class sizes within rather narrow limits. Experience and some research have decreed an upper limit of 40 for non-special classes, while recommendations for maximum class sizes in the special subjects vary with the subject. The lower limits of class sizes are largely a matter of economic policy, with many variations according to the wealth of the district and the needs of some specific pupil.

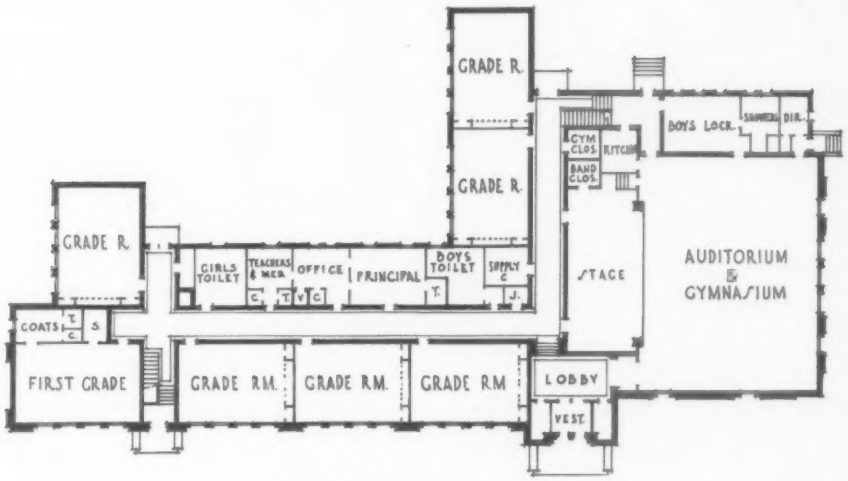
Local policy on assignment of classes to rooms is an important factor in utilization. If rooms are set aside for the teaching of certain subjects regardless of the size of classes in that subject, the utilization will be much less efficient than if classes are assigned to rooms according to the correspondence between class size and room capacity. Likewise, as has already been pointed out with regard to the special rooms, high utilization cannot be obtained unless there is a willingness to assign classes to available special rooms, properly equipped, regardless of the purpose for which those rooms were originally or primarily intended to be used.

Very high utilization of recitation rooms may be obtained if study pupils are assigned to unoccupied seats or stations in rooms housing recitation groups. But this is generally accepted as bad educational practice, and is only a method of obtaining better utilization at the sacrifice of educational efficiency. On the other hand, the practice of setting up a study hall large enough to seat simultaneously all the pupils of a school results in very low utilization of that room, since it is only during a general assembly period that any considerable portion of the student body will be free to occupy those stations. Continued research in this field by the writer has revealed that the peak study load for which permanent study stations should be provided rarely ever exceeds 30 per cent of the enrolment, and varies both according to enrolment and to the number of recitation periods in the school day. Another policy affecting building utilization is that regarding the assignment of study pupils to unassigned classrooms and the library. If a portion of the library is used for assigned study stations, or if available classrooms are used as auxiliary study halls, the number of study stations provided in the regular study hall, and to be required to accommodate the peak study load, is materially reduced. The question of available teachers for study-hall work enters into this problem.

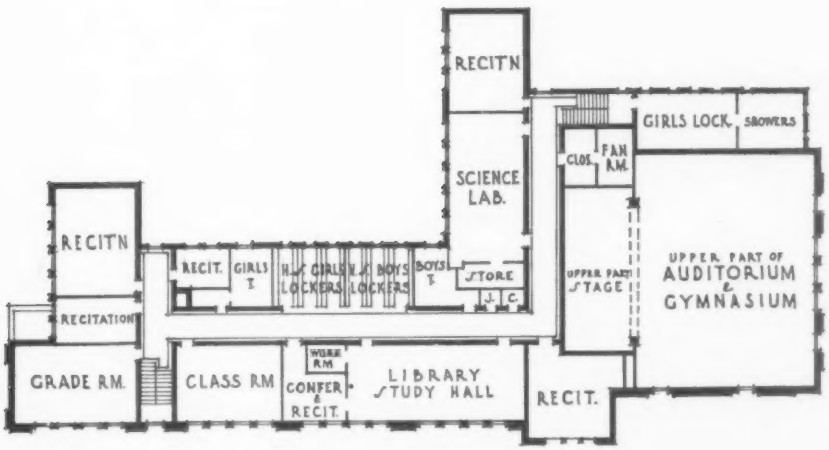
One other utilization factor at least indirectly related to standards of educational practice is that concerning the allotment of space per pupil station for various types of activity. For example, a recitation room may be equipped with 35 seats because local school authorities consider 35 as the optimum upper limit of class size, yet under an accepted rating of space per pupil station, that room may rate as a 40-pupil room. An agreement

[1] The standard classroom unit in this Division is a room 30 feet long, 22 feet wide, and 12 feet high. This room is rated as a 40-pupil room, on the basis of 16.5 square feet of floor area and 200 cubic feet of air space per child.

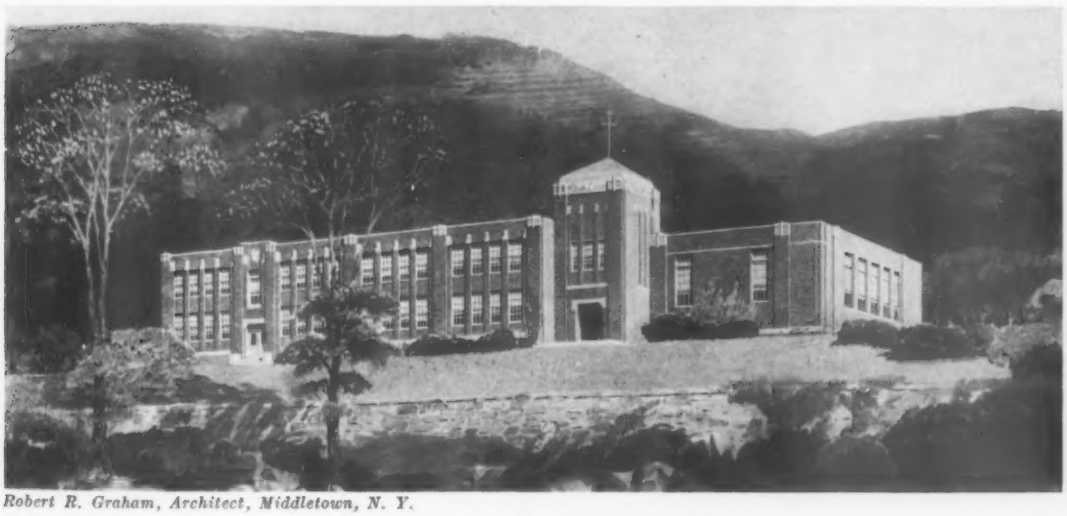
[2] These formulas are simplified regression equations derived in calculating correlation coefficients between classes and enrolments.



FIRST FLOOR PLAN, HAMMONDSPORT SCHOOL BUILDING



PLAN OF THE SECOND FLOOR OF THE HAMMONDSPORT SCHOOL BUILDING



Robert R. Graham, Architect, Middletown, N. Y.

CENTRAL RURAL SCHOOL, HAMMONDSPORT, N. Y.

between standards of class size and standards of area per pupil station is necessary in planning for maximum utilization.

The last item discussed under this division is the use of the cafeteria outside the lunch period. If this room is used only for cafeteria purposes, it is probably the most expensive unit in the building in terms of utilization. In many schools it is being used more or less successfully as a study hall. In New York State we are not especially sympathetic toward this use of the room, but are recommending that cafeterias be designed and equipped to be used as general activity rooms. They may be made especially adaptable for music, oral English, and dramatics rehearsals, by designing the kitchen so that it may be cut off completely from the dining space, and providing a small platform-stage at one end, with storage space for music and musical instruments.

So far this discussion has been confined to the planning of high-school spaces only. In city schools it is a comparatively simple matter to obtain high utilization of elementary rooms, since the enrolment by grades is large enough to make it possible to fill these rooms to capacity. But in the consolidated school this is seldom the case. When grade groups are not close multiples of room capacities, obtaining high utilization is a problem of combining grades. This again involves standards of educational practices as well as economic policy.

Some few attempts have been made to fit the room capacity to grade enrolment by designing elementary classrooms smaller than the generally accepted standard. In isolated cases, where the grade groups are small and the enrolment trends static, this may be a good policy. But in areas where consolidation has been effected, it is probably safer to design classrooms of standard dimensions and depend upon grade combinations to obtain worth-while utilization of the rooms. Combinations can be effected with two grades to a room, or with a grade and a half to a room, depending upon enrolments. An attempt should be made to utilize elementary classrooms to approximately 80 per cent of their capacity.

The foregoing discussion of planning for maximum utilization may be summarized as a series of steps followed by staff members of the School Buildings and Grounds Division of the New York State Education Department, when assisting a board of education and an architect in setting up a schedule of rooms for a new school building. The tables and formulas used are those applying to schools of enrolments between 50 and 400 in grades 9 to 12, since most consolidated (or centralized) schools in this state have enrolments under 400 in those grades. Similar techniques with corresponding but different formulas and tables are used for schools of 400 to 3,000 enrolment in high schools.

1. All planning is based upon an estimated enrolment and predetermined educational program and organization.

2. Kindergartens, when desired, are set up to accommodate a maximum of 35 pupils in one session.

3. Efforts are made to effect elementary grade combinations that will approximate an enrolment of 32 pupils per room, with 40-pupil elementary rooms provided on that basis.

4. Grades 7 and 8 are considered as elementary or high-school grades according to the locally desired organization, and rooms planned accordingly.

5. Special rooms are provided for each type of special subject to be taught, and equipped for dual or multiple use. The capacities of these rooms are set up from the following table: [3]

[3] All tables and formulas used except Table IV are taken from the writer's study entitled "Techniques for Setting Up a Schedule of Recitation Rooms for New York State High Schools of 400 Enrolment and Less." The complete study is in the Education Library at Ohio State University, and digests may be found in the *American School Board Journal* for June, August, and December of 1934, and in the 1934 Proceedings of the National Council on Schoolhouse Planning.

TABLE I

CAPACITIES OF SPECIAL ROOMS

Subject	Enrolment 9–12	Teacher-Stations	Pupil Capacities of Teacher Stations
Science	50–88	1	Comb. Room—30
	89–200	1	Comb. Room—35 to 40
	201–400	2	Adv. Sci. —24 to 30 Elem. Sci. —35 to 40
Homemaking	50–145	1	16
	146–400	1	24
Vocational Shop	50–145	1	16
	146–400	1	24
Vocational Agriculture	50–145	2	Shop 16 Shop Rec. 20
	146–400	2	Shop 24 Shop Rec. 24
Typing	50–128	1	15
	129–184	1	20
	185–296	1	24
	297–400	1	28
Drawing or Art	50–200	None	28
	201–400	1	
Music Dramatics	50–400		Combination with Auditorium or Cafeteria

6. The number of non-special rooms (called interchangeable teacher stations in the original study) is determined from the formula

$$IS = \frac{\frac{E}{8} + 12}{P}$$

where IS is the number of rooms, E the enrolment of high school, and P daily recitation periods. All high-school grades are included in E.

7. The distribution of non-special rooms according to pupil capacity is determined from the following table:

TABLE II

CAPACITIES OF INTERCHANGEABLE STATIONS

Stations Required	Small 20-pupil	Medium 30-pupil	Large 40-pupil
3	1	1	1
4	2	1	1
5	2	2	1
6	2	2	2
7	3	2	2
8	3	3	2
9	3	3	3

8. Permanent study stations are provided in library and study hall, often combining these into one room in the smaller schools. The number of stations is determined from the following table:

TABLE III

RATIO OF PERMANENT STUDY STATIONS TO ENROLMENT

Enrolment	Study Stations
89–145	1/5 of enrol.
146–200	1/4 of enrol.
201–400	1/3 of enrol.

These stations are divided between library and study hall according to the following rules:

8.1 In schools requiring less than 100 permanent study stations, at least one-half of these shall be library stations, with the further limitation that not less than one unit of library space shall be provided in schools of any class.

8.2 In schools requiring more than 100 permanent study stations, at least one-third shall be library stations, with the exception that schools in this class shall in no case have less than 50 library stations.

9. In schools of the enrolment range under discussion, special music rooms are not provided. Classes in theory, harmony, and history are taught in regular classrooms, while group activities such as band, orchestra, or chorus work are recommended for assignment to a combination cafeteria-general purpose room. The general design of this room is described in a previous paragraph. The maximum capacity of the dining space is set up as one-third the maximum cafeteria load, assuming that when necessary the lunch period may be conducted in three shifts. A minimum cafeteria of one unit, exclusive of the kitchen, is recommended.

10. Assembly and physical education facilities are set up according to data given in Table IV.

TABLE IV

ASSEMBLY AND PHYSICAL EDUCATION FACILITIES FOR SCHOOLS OF GRADES K-12 or 1-12

	Enrolments Planned For		
	Less than 600	600–960	Above 960
Combination or separate aud.-gym.	Comb.	Comb.	Separate
Seating capacity of auditorium	——	——	½ P.S.
Free floor space—gym.	2706 sq. ft.	3150 sq. ft.	3150 sq. ft.
Additional floor seating space, gym. or combination	1½ P.S.*	1½ P.S.	1½ P.S.
Minimum stage depth behind curtain	18 ft.	18 ft.	18 ft.

* P.S. refers to the pupil station count of all classrooms, recitation rooms, study halls, and library. This formula is derived by taking ¼ the pupil station count times 6 square feet.

These standards are more or less arbitrary, with no scientific procedures used in their determination. Each gymnasium is provided with one of two size basketball courts—41 x 66 or 45 x 70, and with the additional floor space, if equipped with pull-up or removable seats, will provide adequate space for physical education classes according to the size of the school.

Floor plans and perspectives of two buildings planned according to the techniques and standards outlined, are presented. (See pages 31, 32, and 35.) The Tupper Lake school is a junior-senior high-school building in the Tupper Lake Central Rural School District. The building was planned to house 353 pupils in grades 7 to 12. There are 617 pupil stations provided, and, as planned, this building will accommodate a maximum of 400 pupils when operating under normal conditions. This will permit a pupil-station utilization of 65 per cent. Owing to peculiar local conditions, separate assembly and physical education facilities were set up in this school, as an exception to the standards listed in Table IV.

The Hammondsport building is another central rural school, planned to house 256 pupils in grades 1 to 8, and 150 pupils in grades 9 to 12. The building has a normal maximum functional capacity of 384, and with the 568 pupil stations provided, these figures will permit a pupil-station utilization of approximately 68 per cent. The homemaking and shop rooms are located in a separate building, but the pupil-station count of these rooms is included in the figures given.

The teacher-station utilization in each building will approximate 95 per cent.

Approaching Changes in School-Plant Planning

BY N. L. ENGELHARDT

PROFESSOR OF EDUCATION, TEACHERS COLLEGE, COLUMBIA UNIVERSITY

THE past thirty years have seen very significant changes occurring in the development of the school building. Larger structures on bigger and better sites, superior natural lighting, approved orientation, more satisfactory sanitation, and finer safety factors, are some of the gains that have been made in this period of time. The educator and the architect have learned more about school materials and have been selecting to a greater degree those materials best fitted for floors, wainscoting, and walls. Improvements in ventilation have been very marked, to the end that window ventilation and the unit system of forced ventilation have become widely adopted in various parts of the country. Architecturally, the schoolhouse has been more definitely in keeping with the community plan, thus contributing more directly to community attractiveness. Stairwells have been made to conform to the instinctive attitudes of teachers and pupils requiring such exits in case of need.

Taken all in all, the schoolhouse of today has become a very livable institution. Children's lives are safe when they inhabit these sanitary fire-resistive structures. Their physical health is considerably enhanced because of the progress made in artificial lighting, in improvement of natural lighting, and in the care given to the maintenance and operation of the buildings. This has been the experience over the past two or three decades in all parts of the United States. Probably more attention is being given today to the planning of schoolhouses than to the planning of any other type of public structure.

Planning the School Building for Broader Service

Educator and architect should, however, not rest content with the progress that has been made. Unfortunately, the tendency in the near future may be to get into a planning rut and simply to duplicate the school buildings that were considered superior five and ten years ago. The progressive school architect is of course not content with this kind of planning. He reads the architectural and educational magazines to discover the progress made by others in school planning. He is unwilling merely to reproduce the structures which others have planned. The progressive school architect is constantly searching for ways and means of bringing about a better adaptation of the school plant to educational needs. In this field lies the distinct contribution to be made in school-building planning during the next decade. Changes in planning will be made because educational philosophy, classroom theory, and educational administration itself are rapidly shifting their grounds to make adjustments to new conditions of living and to new social relationships which are in the process of development.

No community should plan a schoolhouse today which is not planned for broader service than for such limited groups as the elementary school, the junior high school, or the senior high school. With the significant decrease in elementary school enrolment, the corresponding increase in high school enrolment, and the constantly enlarging problems of youth, school-building planning takes on new aspects. With the increasing effort to coordinate the educational program of the schools with community life in general, new problems are presented which must be fully considered in school-building planning. With the frequently expressed adult desire to learn more about more things, and to use the schoolhouse for this purpose, the school building again assumes a new burden. Such trends as these cannot be ignored.

The Changing Curriculum and Theory of Administration

The curriculum of the school is changing. No longer is it the sacrosanct document handed down by tradition. The meaning of "curriculum" has been broadened to incorporate the relationship of each individual to his environment and the materials of that environment. The curriculum is undergoing constant change. It is the cooperative product of the administrator, the supervisor, the teacher, and the pupil. It is supplemented by the contributions of the adults of the community. With such a constantly changing curriculum, elasticity in school-building planning is far more essential than it ever has been. This presents an undeniable challenge to the architect and the planner.

The theory of administration of education is changing. There was a day when the administrator commanded and the school operated according to those demands. That day is fast disappearing in our democracy. The teaching staff and the student-body itself now participate in the cooperative administration of a school system. This implies very definite changes in the facilities provided for administration. It even suggests a different relationship of administrative space and location to all the other spaces and locations in the building.

The extension of the length of the school day will become, without doubt, a reality in many a community. The school organization will in greater degree cooperate in its school program with such agencies as the Boy Scouts, the Girl Scouts, and similar club organizations seeking to widen the experiences of youth. Such a program, even though entered into in limited degree by a

community, will have its effect upon the school plant. It requires superior school sites; it suggests sites which have the natural advantages of brook and pond, meadow and hilltop, open spaces and forest glades. Clubs of various kinds will require their rendezvous or their "fire circles" incorporated within the physical plant plan. There will also arise the necessity for planning other facilities at accessible distances from the community to encourage hiking, camping, and other types of outdoor experiences. This movement is at its beginning now in the United States and may be expected to grow rapidly. In other words, such facilities available to a few children have produced results so beneficial that the school will seek to make them available for all children.

The School Auditorium

The auditorium in a schoolhouse has frequently taken on a fixed and formal character. The first part of the word "auditorium" derived from the Latin word "audire"—to hear—has in a large measure determined the nature of the space itself. Individuals coming to an auditorium have come to listen and not to participate. This tendency is again being changed significantly. The "audi" syllables of the word "auditorium" should be given less consideration in the planning of this space. This room is more and more taking on the aspects of a "communitorium" or community center to which adults and children come for the purpose of participating in group activities so that each may gain from playing some significant part in the work that goes on. Many of these large rooms will be planned in future schools with a stage and a stage loft to be sure, but with large adjoining shops in which adults as well as children interested in stagecraft and theatricals may make their own scenery and their own stage devices. In other large rooms adjoining, the costumes and other paraphernalia of the plays may be developed by those interested in design, needlecraft, and the like. In still other spaces adjoining the auditorium will be the rooms in which the plays themselves are produced, as well as the music to accompany them. This community center will become the focus of interest to adults desiring the opportunity of exercising their talents in the arts, music, literature, and handicraft. It is clear that the old type of auditorium nestled in the heart of a building will hardly suffice to make possible this kind of educational program.

The Gymnasium

The school gymnasium is one of the other large spaces in the traditional planning which may be expected to undergo significant change. There will still be left in the schoolhouse the large space to which adult spectators come to witness contests among various specially talented school athletes, but it is hoped that this space will be kept apart from the community center and its stage, and that it will not be the only provision made for the recreation of children and adults. The provision for all types of games and sports should be made in the new school plant. It is quite possible that the area allotted to small spaces in which limited groups may participate will exceed the space given to the larger gymnasium as at present traditionally conceived. Sun decks, open-air rest rooms, correctional gymnasiums and specialized game rooms have much more to contribute to the welfare of the community than the Friday evening basketball contest in which a few play and many are spectators. The architect and the educator must think of this unit apart from the community center, certainly not on the stage of the auditorium, but so arranged within the entire building that a minimum of interference results to other forms of educational activities.

Classrooms

The classroom itself must also undergo change. The military array of fixed seats is rapidly disappearing, even in the most poorly taught school. Freedom of movement for children and teachers is encouraged. Individualization of instruction is being achieved through homogeneous segregation in small groups. The compartments of subject matter are also being broken down so that the classroom is assuming the atmosphere of a place where children are living and in which they are being educated to adjust themselves to the environment of the present day. The effect of these changes in method and classification has already been to increase the size of classrooms, to provide work-rooms between classrooms, and to incorporate larger numbers of conference rooms in which children and teachers may work at special problems. The educational talking picture has pointed the way toward a broader education through the use of this medium with groups larger than the average classes of this decade.

The Architect's Task of Adaptation

In serving the children of the community, the school will be thought of more and more as an adjunct to nature. Terraces which are merely expansions of the classroom will be incorporated to a greater degree in planning. The pond, the orchard, the school garden and the outdoor classroom will serve to a greater degree as agencies for teaching, and will provide finer opportunities for pleasure, recreation, and cultural stimulation. Developments in professional educational thinking and attitudes provide a stirring stimulus to architects and planners to conceive of the physical plant in terms expressive of a new relationship of administrator to teacher, of teacher to pupils, and of school to community. The contributions made by architects in adapting school buildings to modern school needs will be watched with interest in the years that lie directly ahead.

Parochial School Requirements

BY REV. WILLIAM R. KELLY
EXECUTIVE SECRETARY, CATHOLIC SCHOOL BOARD,
ARCHDIOCESE OF NEW YORK.

I. The Small Parish School

THE typical Catholic school building is used extensively for parish as well as school purposes. Here the parishioners gather for meetings, athletics and social activities normal to community life. At times the auditorium must serve as an auxiliary chapel wherein Mass may be said on Sunday. To plan for needs so varied, the architect should have the aid of advisers experienced in this field. Some of the objectives to be considered in designing a parish school are exemplified in the building recently designed by the office of John Russell Pope for the Church of St. Clare, Great Kills, Staten Island. This suburban community has a permanent population of 200 families, but during the summer months the bungalow colony of the nearby beach greatly increases the congregation. The small parish church which is adequate in winter is unable to accommodate the large numbers who come to Mass on a Sunday in the vacation period. The parish problem included, therefore, provision for a summer church as well as suitable rooms for the school and social needs of the permanent residents.

Provision for Various Uses

The accompanying illustrations show how the problem was met. The auditorium is designed to seat 325; the adjoining gymnasium will seat 425. By opening the movable doors a congregation of 750 will be able to attend Mass. Provision is made for an altar on the stage, and the off-stage rooms are fitted for sacristy purposes. The altar may be conveniently screened whenever the hall is used for secular activities.

At the public entertainments which take place a few times a year the audience will number about 500. Usually these affairs are followed by a reception and dance. The hall must be rapidly cleared of chairs, a task which is facilitated by the provision of a room for chair storage. Experience proves that rapid storing cannot be accomplished when the seats are placed under the stage.

In small buildings of this type it is not feasible to provide special dressing rooms for those who take part in the dramatics. The custom is to use a few classrooms, which should be supplied with proper hardware for locking from the inside.

For occasions when refreshments will be served, there is a well-equipped kitchen and serving room adjoining the auditorium. Ample counter space is had by raising the sliding doors between the anteroom and the auditorium.

Normally during the winter months the gymnasium doors will remain closed and the pupils engaged in physical exercise will be separated from the group using the stage and hall. When public basketball games are played, the doors may be opened and spectators will be seated in the auditorium facing the basketball court. The walls of

John Russell Pope, Architect

ST. CLARE'S CHURCH PARISH HOUSE AND SCHOOL, GREAT KILLS, STATEN ISLAND, N. Y.

FLOOR PLANS OF ST. CLARE'S CHURCH PARISH HOUSE AND SCHOOL, GREAT KILLS, STATEN ISLAND

the gymnasium are faced with tile blocks to resist soiling. In the auditorium a tinted plaster will be used on the walls and a special acoustic plaster will be applied to the ceiling.

Attention is called to the corridor and exit arrangements, which will insure convenient dismissal of a capacity crowd. A side exit affords additional exit from the auditorium and gymnasium. To protect the classroom floors against intrusion, gates will be installed at strategic points.

The Classrooms and Their Equipment

St. Clare's School will have eight classrooms. It is expected that this number will meet the parish needs for several years. Presently, the population growth will warrant the addition of four more classrooms and the construction of a larger church on the site reserved for that purpose. Expansion of the parish has been foreseen and cared for in the planning of the present building. A two-story wing with four classrooms can readily be added to the building; the site now occupied by the chapel will ultimately be released for playground use or, possibly, the continuation of the school building.

The classrooms are intended to seat about forty pupils. Desks will be arranged in traditional rows with light coming from the left side only. A bookcase 7 feet high is installed in the front left corner. Above the blackboard, provision is made for a cork display board. At the right front corner a 2½-foot niche is built into the wall for a statuette of the patron saint. With only 10 feet of blackboard space at the rear of the room, opportunity is afforded for the display of pupil work on adjoining cork boards.

Two toilet rooms are included for the first grade

pupils. These rooms immediately adjoin the classroom. Suitably sized equipment has been specified. Lavatories for other children are located on each floor. Care has been taken to make the walls sound-proof.

The Religious Aspect

In keeping with the religious aspect of the school building, the main floor corridor will end in an apse. Within this space and on a two-step platform will be placed a shrine to the patron saint. Upon entering the building, the corridor vista will suggest the religious motif in simple and effective fashion. Appropriate symbols and inscriptions may be used to enhance the religious atmosphere. The cross naturally surmounts the structure or its main entrance. The motto "Pro Deo et Patria" may be inscribed on the cornerstone. Inexpensive medallions may be introduced into the brickwork, and lettering may be fittingly employed to carry some religious message.

Meeting the Budget

In designing for a small parish, the architect is constantly challenged by the limitations of finance. He must care for essentials; he must weigh carefully the choice of other features. The parish cannot pay for everything that is desirable, but it does wish to obtain the maximum in efficiency and comfort.

Instead of spending money on the exterior of the building, the architect of St. Clare's practiced strict economy. There is no stone trim, and yet pleasing effects have been achieved by simple dignity in design and effective use of brick.

Expensive steel truss work does not consume the available funds. Instead, the span of the auditorium and gymnasium has been carefully limited so that inexpensive steel beams carry the weight.

In the development of the design the cubic content of the gymnasium and auditorium threatened to exceed the budget allowance. This content was reduced, not by eliminating either one of the halls, but by the expedient of making the auditorium ceiling 16 feet high and the gymnasium 18 feet high. A further saving was effected by designing the auditorium in its angular form.

All concerned have agreed that no expense should be spared in obtaining really satisfactory folding doors to shut off the two halls. This feature is considered highly important, for the doors must be able to resist weather conditions and the serious strain of gymnasium usage.

Careful study was given to various choices in planning the school quarters. With limited funds, it was not possible to get every desirable item included. One might desire, for example, tiled corridor walls, inter-communicating telephone service, radio equipment, etc., but it was deemed fitting to omit these attractive features in favor of more important factors, such as extra plumbing for the first grade, shower-baths, built-in bookcases, glass window baffles, etc.

St. Clare's School will have a cubic content of 335,000 feet. Its cost is limited to $108,000, excluding the architect's fees. Despite this low figure, it has been possible to include in the building many advantages not ordinarily found in schools of this type.

Wise Planning

The current demand is for a school building that will give much at comparatively small cost. Architects must show ingenuity in planning for essential needs. They should enter into partnership with educational advisers in an effort to eliminate waste and unnecessary expense. They must study school specifications from the viewpoint of parish needs and not from the angle of the publicly endowed school system.

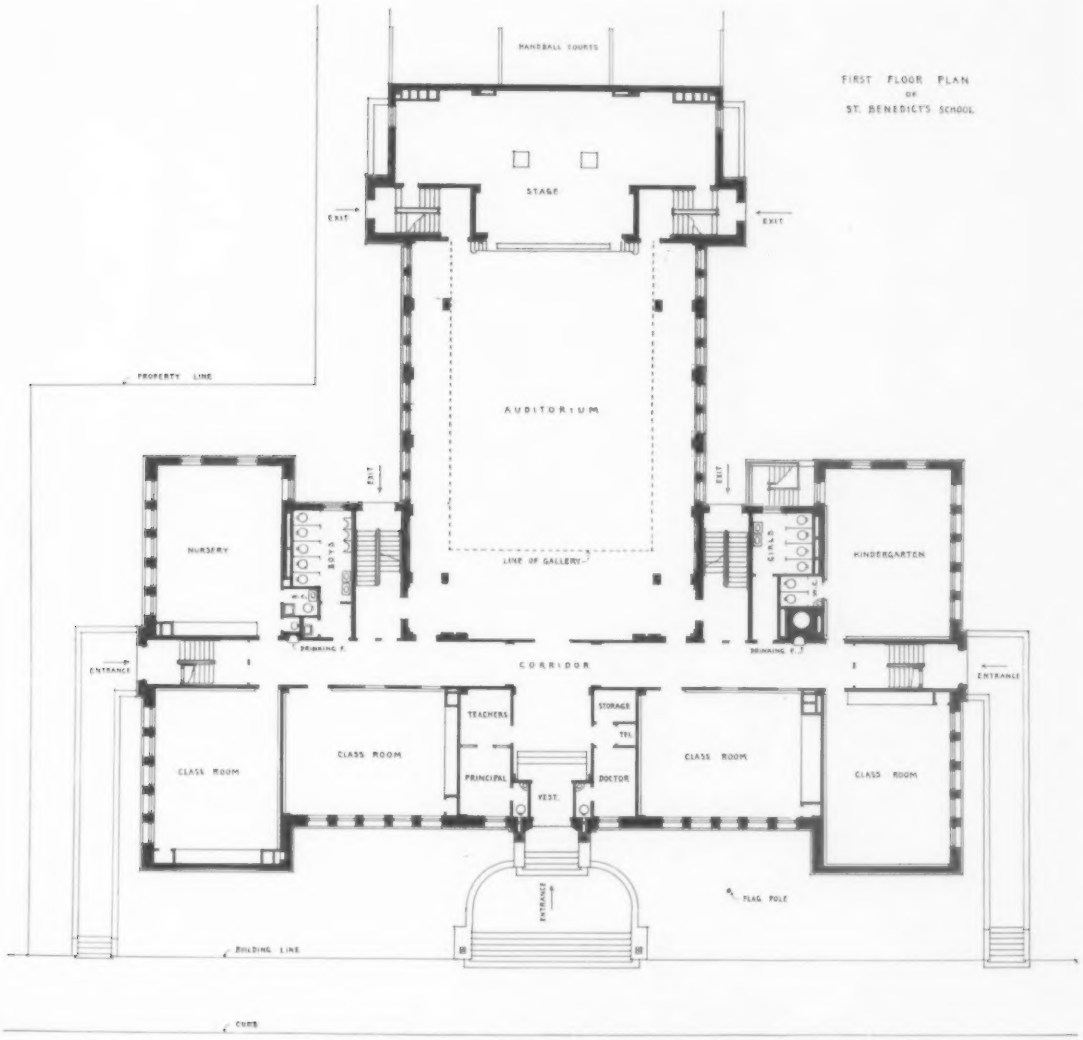
Making due allowance for the difference in their financial status, Catholic elementary schools should be designed to meet the major requirements outlined for public schools in Strayer and Engelhardt's handbook, "Standards for Elementary School Buildings."* An intimate knowledge of this book is to be expected of the architect who plans a Catholic school. If this manual is consulted on every phase of the building program and if technical counsel is given from the Catholic viewpoint, the result will be a building well adapted to the needs of Catholic life—religious, educational and social.

* Columbia University Press, New York, 1935.

II. The School in a Large Parish

LARGE or small, parochial schools generally strive to meet two objectives: provision for the educational program; and facilities for social life in the parish. Naturally, the latter objective is more completely realized in parishes that have a large and flourishing congregation. Typical of such parishes is that of St. Benedict, with a population of 5,000 adults and children. In 1931, St. Benedict's, situated near Eastern Boulevard in the borough of the Bronx, New York, erected an imposing Lombard-style structure set on a plot of ground running through the entire block, a distance of 200 feet.

The building is T-shape in plan, 145 feet long, 60 feet deep, with a center extension 75 x 72 feet. The extension houses an auditorium and gymnasium; the main building provides for 20 classrooms. Each of the classrooms is 22 x 30 feet. Their specifications include austral windows, clothing wardrobes recessed into the rear walls, and mechanical ventilation. Movable furniture is used in the lower grades.



LAYOUT OF FIRST FLOOR OF ST. BENEDICT'S SCHOOL, THE BRONX, NEW YORK CITY

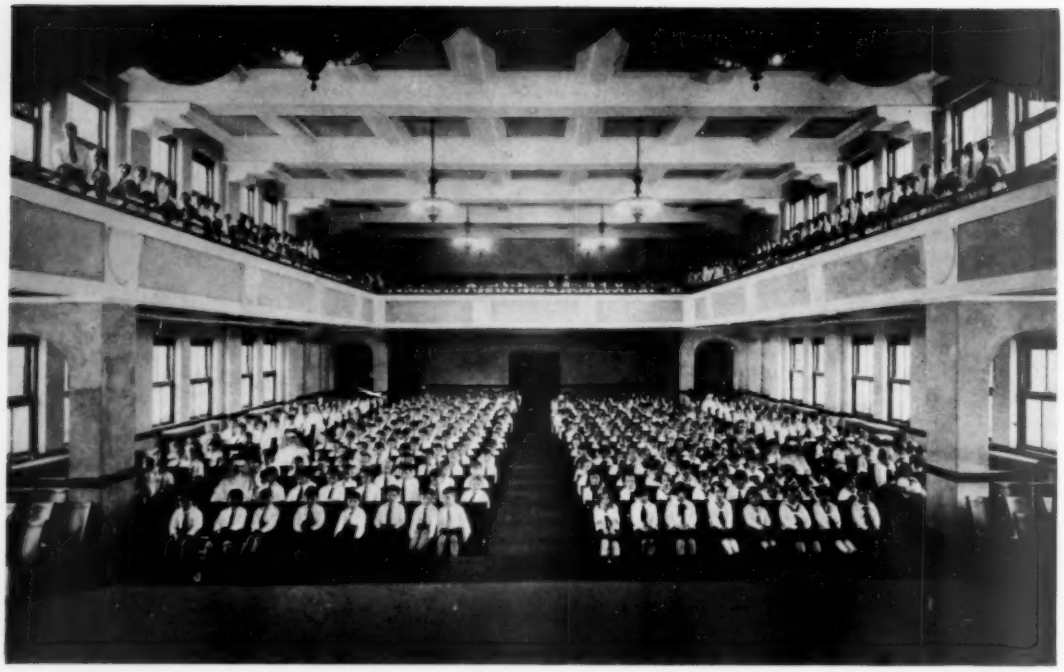
The Main Floor

The main entrance of the building leads into a vestibule and lobby with marble steps and faience tiled floor. The corridors are of terrazzo with borders of varied colors. The vestibule and lobby walls resemble caen stone. The ceilings are vaulted and paneled and are to be decorated in polychrome.

To the right of the lobby are the reception and the principal's rooms. On the left are the doctor's and nurse's office and the stationery room. Just beyond the main corridor is the auditorium, which occupies the central portion of the "T."

The auditorium, 50 x 70 feet, with a height of 28 feet, has a balcony on three sides. Large windows on both sides of the auditorium provide good light and cross-ventilation. The main floor has a seating capacity of 600, and the balcony accommodates an additional 250. Exits are provided at the four corners in addition to the main entrance. The walls and ceiling of the auditorium are treated with acoustic plaster.

The stage, 15 x 25 feet, is equipped with trapdoors, a signal system to the motion picture booth in the balcony, and complete theater lighting devices. Chairs may be stored on trucks under the stage. Staircases on either side of the stage afford direct exit and lead also to dressing rooms and lavatories on the floor above. The main floor of the school has, besides the rooms mentioned previously, four classrooms, two lavatories, and a nursery and kindergarten. Each of the latter rooms has an adjoining lavatory. At either end of the main corridor are stairways to the street and to the upper floors. In addition, there are staircases on each side of the auditorium, leading to exits as well as to the basement and second floor of the school.

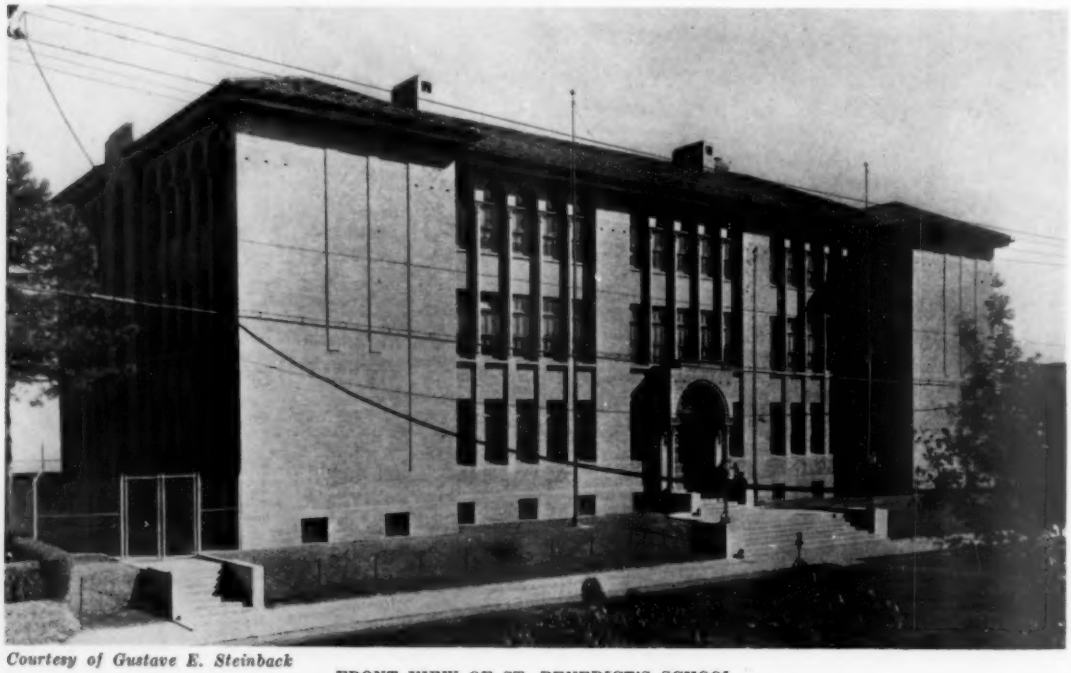


THE AUDITORIUM OF ST. BENEDICT'S SCHOOL

Second and Third Floors

On the second floor there are six classrooms, two lavatories and a centrally located library room with accommodation for 3,000 volumes.

The third floor is arranged for ten classrooms, three of which open out on a roof playground over the auditorium. Two stair penthouses provide access from this playground to exits below. The attic of the main building houses the vent ducts



Courtesy of Gustave E. Steinback

FRONT VIEW OF ST. BENEDICT'S SCHOOL

Photographed by Miller's Photo Studio, New York

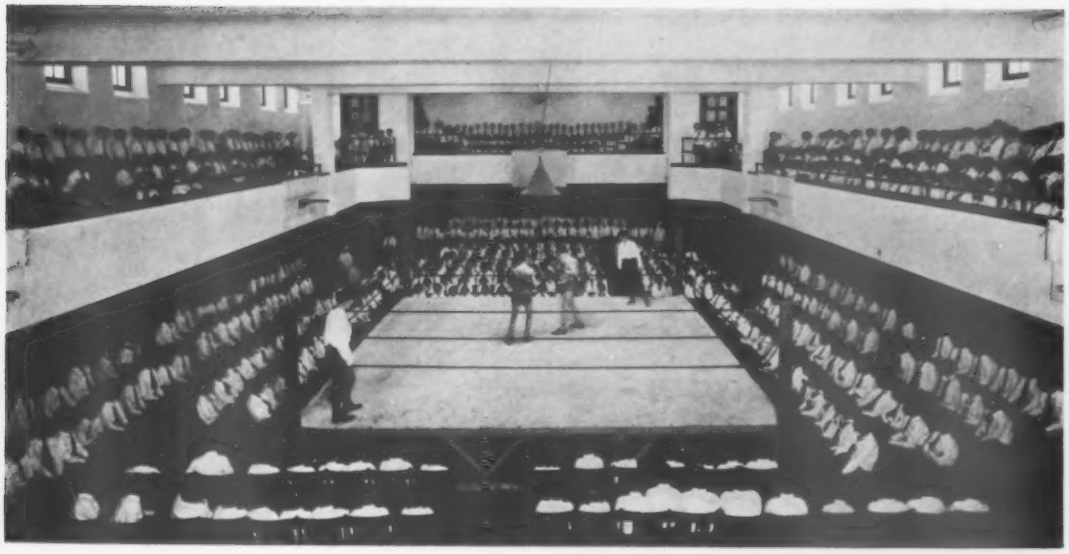
ABOVE—THE ROOF PLAYGROUND

AT RIGHT—THE KINDERGARTEN

BELOW—THE GYMNASIUM, WITH PORTABLE BOXING PLATFORM

ST. BENEDICT'S SCHOOL

Miller's Photo Studio, New York



leading from the various rooms of the building to the vent flues of the roof.

Physical Training Rooms

On the mezzanine below the main floor are four bowling alleys; a billiard room with two tables; a physical training room; a locker room for the school band; a lunch room connected with the basement kitchen by means of a dumbwaiter; and two lavatories.

Directly under the auditorium is the gymnasium. On four sides of the gymnasium is a spectators' gallery. Farther back are the showers and dressing room for the girls, and immediately below are similar accommodations for the boys. An automatic shower mixer controls the temperature of the water.

The gymnasium has a clear height of 28 feet. Its walls from floor to underside of gallery are faced with glazed terra cotta tile. Six baskets are provided for basketball practice. A regulation boxing light may be mechanically lowered over the portable boxing platform. Bleacher benches increase the seating capacity of the hall. A ventilating system supplements the natural cross-window arrangement, thus insuring good air in both gymnasium and auditorium. Adjoining the gymnasium are the apparatus room, meter and transforming rooms, kitchen and boiler room.

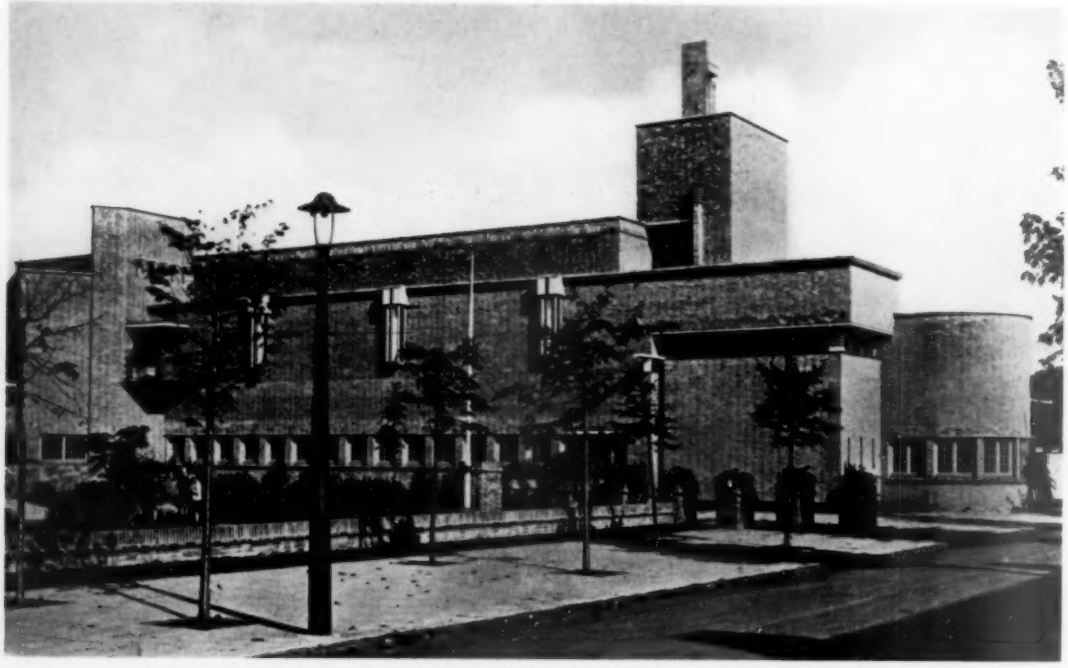
The building is oil-heated by means of a vapor system. Provision has been made for an additional boiler to take care of future parish buildings.

There are six fireproof enclosed stairways throughout the building with wire mesh running the full height, double hand-rails, rubber treads with safety nosings, and rubber-linked mats sunk flush in all vestibules.

With this equipment and the generously spaced outdoor playgrounds, St. Benedict's school provides admirably for the educational, social and athletic needs of pupils and their elders.

The cost of the building, $350,000, is defrayed by the regular parish contributions of the people. The small per capita offerings given consistently Sunday after Sunday by an active congregation, numbering 4,000 adults and 1,000 children, enable the pastor, Very Reverend Richard Simmer, O.S.B., to maintain the entire work. Father Richard, a Benedictine Monk and an experienced educator, collaborated with the architect, Gustave E. Steinback, in determining the plans and equipment of the building.

A School in the Netherlands



CHRISTIAN SCHOOL, EIKBOSSCHERWEG, HILVERSUM, HOLLAND

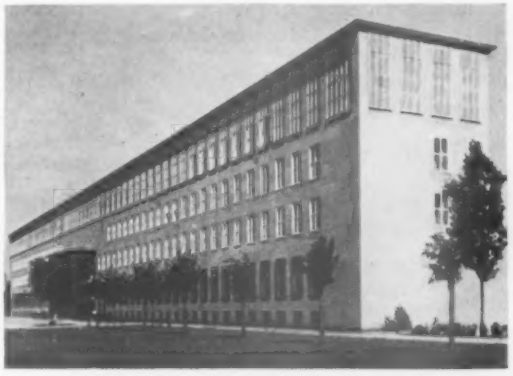
The New Home of the University of Cologne

BY R. DE VAU

COLOGNE has been a university town for ages. The beginnings of higher learning in Germany, illumined by the names of such men as Albertus Magnus and Duns Scotus, are to be found here. Next to Paris, the most famous higher school of the Middle Ages was located in Cologne. It has survived many centuries. The occupation of the left bank of the Rhine by the French toward the end of the 18th century caused Cologne a great loss through the closing of the University, a loss from which it was not able to recover during the 19th century. By its own efforts the city erected some high schools at the beginning of the 20th century and they were to form the foundation for a distinguished university. However, what was lacking in Cologne until 1934 was a university building that would do justice to all claims of modern research, study, instruction, and student life.

The present University has made possible the building of two fronts—a street front with the main entrance, the administration and library wings; and another front, facing on a quiet park, with the study rooms of the seminaries. The choice of the site was influenced by the proximity of the large Cologne hospitals, with the modern facilities offered by the medical faculty. A further transfer of the Institute of Science to the immediate neighborhood of the new building will contribute toward developing a concentrated university quarter. The new building contains all general classrooms as well as the seminaries and the Institutes of Economy, Law, and Philosophy, and the main divisions of the University and municipal libraries.

Owing to the location between street and park and the requirements for distribution of available



LIBRARY WING OF THE NEW UNIVERSITY

space, we find the following arrangement: On the street side there is a long building with the main entrance; with the library in the south wing and the administration rooms in the north wing, both immediately accessible from the entrance. On the park side there are six pavilion-like wings, with connecting terraces for the workrooms and lecture rooms of the seminaries and institutes. The third group of buildings is located between the first two and contains the largest halls; in the center the auditorium with its corridors, main dressing rooms, and refreshment rooms, and at the right and the left two buildings with large lecture halls.

The auditorium is the nucleus of this building. It consists of two lecture rooms which can be made into one by means of a sliding door. Thus is obviated the uneconomical maintenance of a large, seldom used hall. The determining factors in

VIEW OF THE UNIVERSITY OF COLOGNE FROM THE SOUTHWEST

THE SIX WINGS FOR THE SEMINARIES AND INSTITUTES

building the auditorium were the acoustics and the capacity of the human voice. It is shaped like a loudspeaker, widening to the rear, and the floor and the ceiling slant upwards. The hall has a capacity of 1,450 seats, including the galleries, and lends itself well to musical performances and festivals of every kind. For this purpose, and more especially for the benefit of the theatrical institute, a small stage has been erected which can also be used for an orchestra or a choir.

The combining of the two main divisions of the University and municipal libraries in the new building was another important factor in the space program. It was the intention to make the intellectual resources of the library as accessible to the University as possible. In the large, light study rooms of the street floor there are 250 seats for readers; in the upper stories are the lending library, the catalogs, and the office, while the storage room for books occupies the entire length of the topmost floor of the building facing the street. The three-story storeroom is built of steel, with adjustable shelves for the books, and offers space for 800,000 volumes. Dumbwaiters connect the storeroom with the lending library and the reading rooms.

The almost 40 seminaries and institutes which are housed in the new building have libraries of their own in many instances.

There are 22 lecture rooms distributed over the entire building, all with facilities for showing motion pictures. Their capacity varies from 25 to 750 seats.

Especial value was placed on an attractive rest room and refreshment room for the students. In this connection, the large room on the park side, in which the daily newspapers are also to be found, proved just the thing. There is a small cafeteria for light refreshments. The new building covers about 175,000 square meters. The total floor space of the individual stories amounts to about 30,000 square meters, of which about 20,000 are occupied by lecture rooms and workrooms, and the rest by corridors, staircases, etc.

The rising development of Germany has brought it about that, whereas formerly the university students were recruited mostly from the important towns and landed estates, we find that today they come from middle-class families in small and medium-sized cities as well, and even from villages. Those very students, whose professional tasks will, in the majority of cases, take them back into the comparative narrowness of small or medium-sized towns, feel a desire to spend a part of their university life in a large modern city. Furthermore, a metropolitan city, with its eager activity, its lively industry, with its collections and museums, with its opportunities to enjoy art and a more cultured life, offers these students a wealth of stimulation not to be found elsewhere. And Cologne is able to offer more in this direction than almost any other city. For a thousand years it has been one of the most important centers of artistic life in Germany. Whoever lives and studies in Cologne has an opportunity to become acquainted with the great history of occidental art; he will acquire a most diversified knowledge, such as can be obtained in few other German cities.

IRMO HIGH SCHOOL, IRMO, S. C.

A Modern School in a Small Town

BY HEYWARD S. SINGLEY
ARCHITECT, PROSPERITY, S. C.

THE Irmo (S. C.) High School, now nearing completion, is not unusual from the standpoint of planning, but from the standpoint of location and design it is worthy of consideration. It is located in a small, isolated town of about 500 people. Practically all the pupils are from homes of small cotton farmers living among the sand hills of District No. 45, Lexington County, S. C. Now, the fact that these children from the country have a new school located in a small town is not impressive, but that they have a school building as modern and well-equipped as almost any school in our cities,—that is something. The materials are perhaps not as expensive as those used in our wealthier districts, but they are all good and of a permanent nature.

A survey of the district was made by the Division of School House Planning of the State Department of Education to determine the size of building needed, number of rooms, etc. The requirement, in effect, was a building to accommodate 350 children, sufficiently large to take care of any increase during the next ten or fifteen years.

The exterior elevations were necessarily kept very simple. That, I think, if done correctly, is where real beauty and dignity lie. The photograph shows that the building is almost severely plain, practically free from offsets and elaborate ornamental work. The fact that the roof is devoid of dormers certainly lessened the expense and the possibility of leaks.

The exterior brickwork is almost perfectly laid in running bond of sand-finished common brick. The base of the building, which extends to the height of the first-floor window stools, the frieze and portions of the entrances are of highly burned common painted brick. There is usually much opposition to the painting of brickwork, due to the first thought of its having to be repainted in a few years, the same as exterior woodwork. This is not at all true unless a sense of beauty dictates the painting. In this case, painting the brickwork was not to protect any under surface, as is true when wood is painted, but was done for effect and contrast of materials. If it should begin to weather and appear motley after several years, there will almost always remain sufficient paint to give the desired contrast, and the mottled effect may be even more beautiful than a fresh coat. The small amount of stone used about the entrances, belt course and window stools is limestone with a shot-sawn texture which blends perfectly with the texture of the brickwork. A color contrasting sufficiently with the outside work, which is painted oystershell, gives the desired effect.

All outside walls are of solid brick with concrete footings, and the interior partitions, floor and roof construction of wood. The roof covering is a variegated dark green and brown American method asbestos shingle, and the decks are of composition.

General Layout

The plan is a very functional one, having proper orientation. The central unit, or school proper, faces east, while the auditorium is on the north and the gymnasium on the south. The boiler room is in the exact center of the building. This not only is the ideal place for the correct distribution of radiation, but also permits the stack to enter through the roof at a logical place from the standpoint of design. The stack happened to enter the roof just to the rear of the ridge line. This permitted the construction of a unique ventilator for the roof as well as allowing the vent ducts to terminate without having to go through the roof at several places.

The industrial arts department was located under the stage, to utilize the always excessive waste space, and in this case, owing to the lay of the ground, no excavation was necessary. A tar-rock sub-floor was laid here, with wood as a finish, which is ideal for this department. Ample space for the storage of lumber is available through an access door under the auditorium proper, also due to the natural lay of the ground. The walls of this department, stage, gymnasium and stair towers are of sand-finished brick, the same as the exterior of the building. All the motor outlets necessary for the operation of the equipment in this department are in the ceiling instead of the floors or walls, making it more convenient to shift equipment and to eliminate wires on or about the floors.

Upon entering the auditorium one finds rest rooms available, used by the teachers as well as the public. There is a ticket booth near the entrance. The sloped floor of the auditorium makes it possible for all of the 680-capacity audience to see without any obstructions. The stage is sufficiently deep and has dressing rooms, one on each side. The customary amount of artificial lighting, which includes footlight trough, floor receptacles and overhead lighting, is installed. From the auditorium a stair leads to the space above the rest rooms, which houses the music department. This consists of three practice rooms and the motion picture projection booth, which is of fireproof materials.

The gymnasium as well as the auditorium is well lighted and ventilated by windows on the two side walls. The window stools in the gymnasium are sufficiently high to accommodate the standard height apparatus rail, and will permit three rows of removable bleachers to be placed beneath them. A separate entrance from the outside, corresponding with the auditorium entrance, is provided. The boys' and girls' locker and shower rooms are located near the entrance. From the gymnasium a stair leads to the space above the dressing rooms which is used for boxing and wrestling.

The central unit proper consists of thirteen standard high-school classrooms, with seating capacities ranging from fifteen to forty. A large library and study hall combination room, bookkeeping and typewriting rooms, and three laboratories—home economics, biology and chemistry, science and physics—are in this unit. There are the usual provisions for the superintendent, principal and other departmental heads, as well as ample storage and apparatus rooms. Both boys and girls have toilets on each floor.

There are two means of egress from the second story through the fire towers. This feature, I think, originated in the Carolinas and has now become a standard and law for schoolhouse construction in these sections. At the entrance to these towers ornamental canopies for busses to drive under in inclement weather have been provided, for most of the pupils are conveyed to school by bus.

Heating, Plumbing and Electrical Work

A low-pressure vapor system of steam heat supplies direct radiation to all rooms except the gymnasium, which has unit heaters operated by thermostats. The boiler is fired by a mechanical automatic coal stoker. Hot water is available at all times either by means of the attachment to the main steel boiler or by the hot-water supply boiler.

City water not being available, it was necessary to drill two wells on the site and install a pneumatic water-supply system. Flush valves were used on all fixtures. Ample numbers of drinking fountains are placed in the building and on the outside near the playgrounds and athletic field.

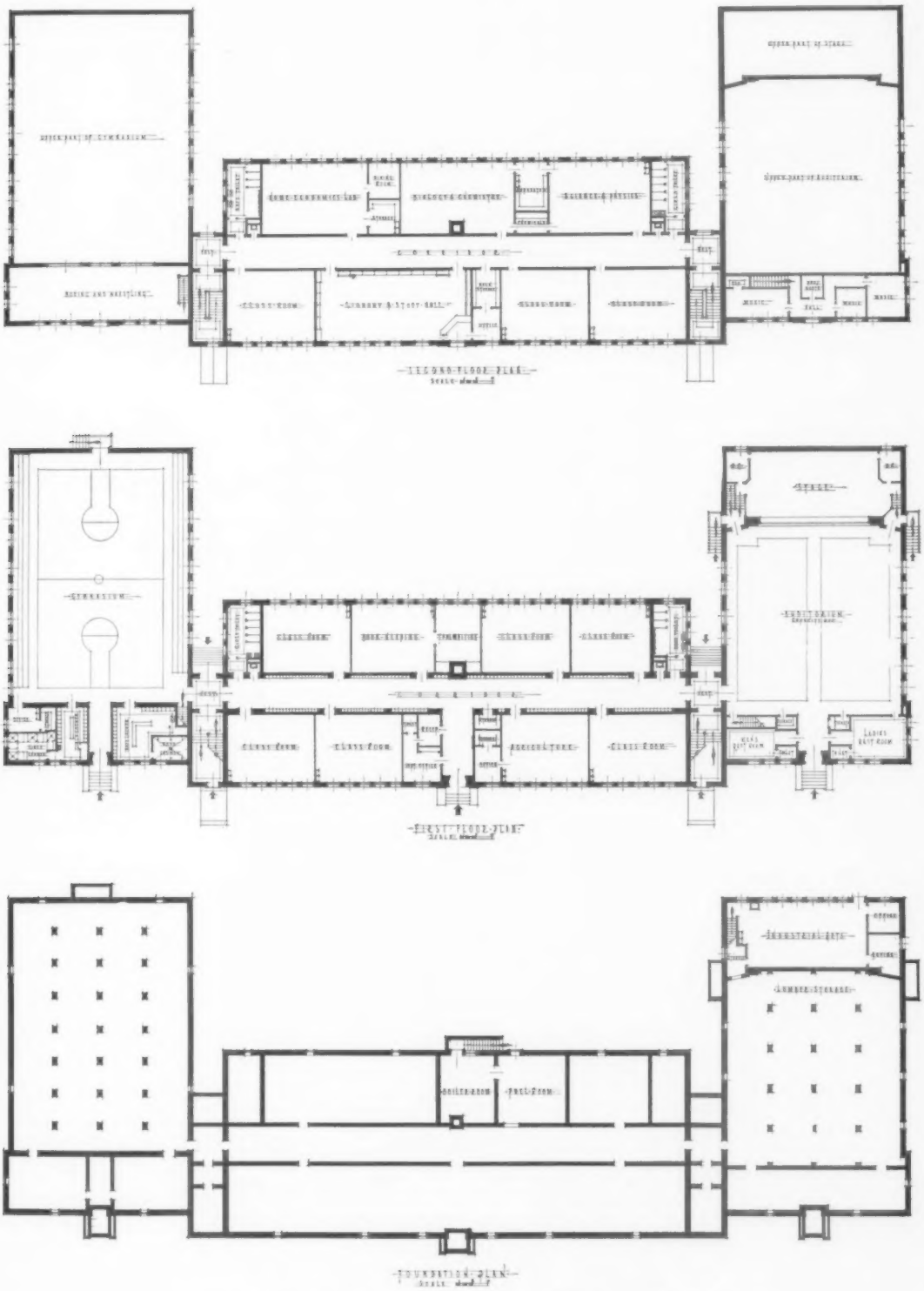
Lighting service is 110/220-volt, single-phase, and power is 220 volts, single-phase. The wiring is standard flexible cable. The cut-in is underground steel conduit and lead cable. There is a complete centrally controlled radio and public address system, which includes microphones, radio tuners, phonograph pick-ups, amplifiers, control and distribution panels and reproducers. There is also a clock and program bell system complete with buzzers in all rooms and outside weatherproof gongs.

Interior Finishes

The walls of the classrooms and corridors are plastered with a sand finish made especially for color, so as to eliminate painting. This gives a soft, pleasing effect in its natural tint, blending with the fibered tile ceilings, which were given two coats of cold water paint. The fibered tile was used not only for economy but for its unusual effect and sound-absorbing quality. Standard stock units were used, 2 x 4 feet, shiplapped and bevel-edged. The interior trim and floors have two coats of a penetrating wax stain which permits the variations in the grain of the native pine wood to be seen.

The auditorium walls are done in white finish plaster painted ecru to match the simply ornamental framed ceiling of acoustical plaster. The music rooms have walls of fiber boards and tiled ceilings, both painted ecru.

In the locker and shower rooms a color scheme of green and gray has been used to harmonize with the lockers and shower partitions. Brown steel lockers of the double-tier type are built into the corridor walls, and the spaces between them are painted with enamel the color of the lockers. This gives an unbroken 7-foot-high belt or base the entire length of the corridor. The continuous belt effect is used in the classrooms in the installation of the blackboards and bulletin boards. Beginning in each classroom at the left front corner, where a teacher's cabinet is placed, the blackboard and bulletin boards form a continuous line across



FOUNDATION AND FLOOR PLANS OF THE IRMO HIGH SCHOOL, IRMO, S. C.

the front and corridor wall sides, uninterrupted except for the door to the corridor. Black metal strips hold the blackboard surfaces and cork board true to plane and in place.

Equipment

All the furniture and equipment, from floor mats and trash baskets to laboratory furniture and stage sets, was let under one contract. A brief list of a few of the general types used follows:

Auditorium chairs: seats and backs 5-ply 7/16" thick, non-upholstered deep curved type, ball-bearing hinges and ornamental end standards, color harmonizing with stage curtain.
Stage curtain and sets: curtain and valance of California orange Saluda grade velour, one drapery border, two tormentors. Two stage sets, one exterior and one fancy interior.
Window shades: double roller type, pre-shrunk 8-oz. canvas, color ecru.
Students' desks: movable chair type.
Teachers' desks: 20" x 72" x 30" high, tops 5-ply 1" thick; drawers, no book rails.
Library tables: 36" x 72" x 30" high, 1½" 5-ply quartered oak tops and plain oak bases, brass shoes.

The home economics suite is a combination room which is planned to be used for sewing, cooking and high-school recitation. The capacity is 20 pupils. Electric hot plates are used for cooking, and the sewing machines are also operated by electricity. When the suite is being used for sewing, the hot plates are removed from the tables and placed in storage rooms. The utensils are stored in the pantry. The dining room is used both as a living room and as a fitting room. A 7-cubic-foot electric refrigerator is in one corner of the room, and an electric range in another. Two sinks are provided, one a double sink for dish washing, and the other a combination sink and laundry tray with drainboard. An ironing board is placed just in front of the sewing machines.

The biology and chemistry laboratory is a combination one also, and may be used for recitation. The capacity is 24 pupils. All are seated at tables facing the front of the room. Individual storage lockers are provided. Chemical-proof sinks are placed in the instructor's desk, and three between tables. The tables are equipped with gas, electricity and water, and have black carbonized 1⅝-inch thick tops. A fume hood is in one corner of the room, and a growing-bed near the outside wall. Storage space is provided for apparatus and chemical supplies.

The science and physics laboratory and recitation room seats 20 pupils, so as to face the front of the room. Individual storage space is provided. There are two chemical-proof sinks in the laboratory, one in the instructor's desk and one on the rear wall. The tables are equipped with gas and electricity and have acid-resisting tops with metal uprights and cross-bars.

The manual training department is equipped with one 6-inch jointer, one 14-inch band saw, one drill press, one circular saw, one speed lathe, twenty vises, and all necessary accessory tools for machines and hand. One model manual training table was bought, and the remaining nine are to be made by the students in this department.

This project, with a total cost of approximately $125,000, was financed through the Public Works Administration and built by W. A. Crary & Son, Columbia, S. C. Plumbing and heating were done by J. L. Powers, Bennettsville, S. C. The Superintendent of the school is A. C. Daniel.

State Construction Codes for School Buildings

BY FRANCIS R. SCHERER

ARCHITECT, BOARD OF EDUCATION, ROCHESTER, N. Y.

THERE is a growing tendency for state departments of education to adopt building laws representative of good and safe schoolhouse construction. A proper code, effectively administered, would afford to each school district an assurance that its new building fully measures up in requirements of planning and construction. It assures school authorities and parents of children obliged by statute to attend school that such children are being educated in a building which affords effective safeguards to life and health.

Administration of the Code

A proper code might be looked upon as one which presents the best present-day thought in connection with planning and construction. It would set forth in its early pages the factors governing its administration. Therein the provision would be made for the requirements of the code to be either minimum requirements that are mandatory, or alternatively items and practices suggested as desirable to follow. Where it becomes mandatory to follow the code, the office administering it is necessarily staffed with technicians able to check for compliance the drawings and specifications submitted to it for approval. While this is a more costly procedure, it would serve as an important check upon whether or not the needs of the community were being met in accordance with good and up-to-date planning and construction.

Site—Classroom Planning—Lighting—Egress

An early section of a suitable code would set forth the minimum factors governing the choice of a site for a building. These would have to do principally with size, character, and location of present or permitted occupancies in the neighborhood.

Another section would contain suggestions for classroom planning, based upon the experiences of eminent schoolhouse planners and school administration officials throughout the nation. It would emphasize those factors relating to interior arrangement, etc., which make for the satisfactory carrying-on of the required instructional programs. This section would be sufficiently elastic to admit of such departures from present-day practice as would merit a trial in the opinion of the approving officials. Considerable work in this field has already been done by the National Council on Schoolhouse Construction and the National Advisory Council on School Building Problems.

A section on natural and artificial lighting would concern itself with the amount and location of glass, of electric fixtures and outlets. For several years past, this work has been carried on by the Illuminating Engineering Society and the American Institute of Architects working in conjunction with a committee made up from many prominent societies and organizations interested in the subject. Their most recent "Standards of School Lighting" has been approved by the American Standards Association.

A very important section would have to do with means of egress, corridors, stairways, and exits. Its basis would be the findings of the Committee on Safety to Life, of the National Fire Protection Association, a committee which has devoted many years to study and experimental work in making the determinations as to required facilities essential to provide suitable safety in the event of fire or panic.

Type—Materials—Construction Requirements

The type of construction required for a particular building would depend upon its height and area, ranging from frame construction for small one-story buildings to fireproof construction for buildings more than two stories in height.

Of interest to manufacturers and vendors of materials would be a section setting forth the minimum test requirements for the important materials of construction such as steel, cement, concrete, brick, stone, and lumber. Data pertaining to these are available from such nationally recognized sources as the American Society for Testing Materials, the American Concrete Institute, and the National Board of Fire Underwriters.

A section of the code would be devoted to the requirements of construction and would have to do with the problems concerning the preparation and construction of a suitable foundation, foundation walls, masonry walls, floors, roofs, partitions, structural framing, etc. These requirements are set forth in the building codes of various communities which maintain building inspection offices. Where these codes do not apply, reference can be made to the Building Code of the National Board of Fire Underwriters and to the various reports of the Building Code Committee of the Bureau of Standards, Department of Commerce.

Requirements for plumbing work are usually set up by the health officer having jurisdiction in the community or by the health department of the state. Minimum requirements should be set forth in the code, however, to govern where no requirements exist. Much work on this phase of

a code has been done by the sub-committee on plumbing of the Building Code Committee of the Bureau of Standards.

Heating—Ventilating—Electric Wiring

The section on the requirements for heating and ventilating would contain the best suggested practices released by the American Public Health Association and by the American Society of Heating and Ventilating Engineers. The points not mutually agreed upon by these groups would necessarily have to be either accepted or rejected by the authority creating the code.

Provisions for the electric work in the building, which includes the electric wiring for lighting, power, fire-alarms, clocks and signal systems, would conform to the requirements of the latest National Electrical Code. It is general practice to have the contractor submit a certificate of approval covering all electric work, following an inspection by the Board of Fire Underwriters having territorial jurisdiction.

An important feature to be included in a modern code would be for a not too difficult procedure whereby planning or construction practices not specifically permitted in the code might be presented for the consideration of the authorities in whom would be vested, or delegated to an advisory board, the power to grant approval. This provision would offset one of the major objections to codes, namely, that they have a tendency to destroy creative ability and consequently defeat progress.

A requirement to be included in such a code would provide for its revision at stated intervals. Such revisions could be made by a standing board or committee empowered for that purpose at the time of the adoption of the code. Thus would the requirements be kept up-to-date and embrace, so far as practicable, the findings of the enforcing officials and the requests of those engaged in the manufacture of materials, design of structural systems, or of equipment; also findings resulting from research and investigation, much of which is going on at all times in various parts of the country.

Extra Costs in the Construction of School Buildings

BY FRANK M. MISNER

BRONXVILLE PUBLIC SCHOOLS, BRONXVILLE, N. Y.

THE construction of a school building is an exceedingly important enterprise. The amount of money involved is usually a relatively large one. A long period of service may rightly be expected of the completed building. Both of these factors make it imperative that the building program be so planned and executed that the community will receive a maximum return for its investment in the form of a building well adapted to the educational program which it is expected to house.

Those in charge of the expenditure of the funds involved may be thought of as custodians of trust funds. The results of their management, for better or for worse, tend to be felt over a long period of time. The degree of wisdom and efficiency with which the school administration and the board of education discharge this trust affects considerably the confidence which the community has in its school officials.

Among the troublesome problems involved in a building program are those connected with extra costs. Unless they are anticipated and controlled, "extras" may be the source of delay and of excessive cost to the school district.

For the purpose of this discussion, extra costs may be defined as any payments made to the building contractors or to the architects for work in connection with the erection of the building which are not covered by the original contracts between these individuals and the board of education, both as to the definition of the work to be done and the total payment to be made. Thus, payment for an alternate accepted after the signing of the contract would not constitute an extra cost, because the total cost of the work to be done, if the alternate were accepted, was specified in the original contract. The term "extra" is used to designate the item for which the extra cost payment was made.

Extra Costs as a Source of Excessive Costs to School Districts

The primary purpose of competitive bids on the contracts for erecting a school building is to secure for the school district the advantage of purchasing the services of the bidders in an open market and therefore of securing the lowest available price for services and materials of a given quality. Once the contracts are let, this open market no longer exists. Thereafter, any departure from the accepted plans must be bargained for in a closed market where only one bidder is available. Added to this factor which increases the costs, is another. Changes from the original plans upon which he has based his own planning are likely to be costly to the contractor himself. These costs he rightly passes on to the owner. It therefore appears to be clear that changes from the original plans will be costly to the owner.

The practice sometimes adopted of attempting to offset an extra cost by another change resulting in a deduction from the contract price is not the proper solution. All changes in the plans after the contracts have been signed must be bargained for in the same manner whether they result in additions to or reductions from the original contract price. In case the change results in a deduction, the contractor is at least entitled to the profit he would have realized by carrying out the original contract. Owing to his favorable bargaining position, he will usually withhold more than this. The result is that when a change in plans is made resulting in a deduction, the board of education pays part of the cost of the item as computed in the original contract price without receiving the item itself. This is no way to reduce excessive costs, since such costs must be thought of in terms of the product received.

The prevention of excessive costs must be effected by careful planning before the contracts are let. Once the contracts have been let, an additional safeguard should be taken against unwarranted changes. The board of education should adopt an ironclad rule that no extra cost will be allowed where a change order, based on an agreement of the contractor, the owner, and the architect, does not actually precede the work.

It should be recognized that all extra costs are not sources of excessive expense. There are often situations where it is impossible or very difficult to determine, prior to the letting of the contracts, the exact amount or quality of the work or materials necessary or desired. Such situations are usually covered by unit-price bids. When the contracts are let, it is necessary to take into account the unit-price bids as well as the bids for the entire contracts. Any extra costs which may come under the unit-price clauses do not come as a result of a change in the contracts. They are the result of open-market bidding. The factors which tend to cause excessive costs do not apply here. There is no reason to believe that these unit-price extra costs are higher in proportion than are the costs of the items which go to make up the original contract prices. Careful planning will enable school officials to prevent some of the more costly extra costs by providing for unit-price extra costs.

The use of alternate bids is a promising method of preventing losses of the type described above on large items where it is possible to specify exactly the amount and quality of the work and materials but where there is doubt prior to the letting of the contracts whether the item is desired, or which of several combinations is desired, or whether there will be sufficient funds to include all the desired features. The securing of bids on each of the several alternatives gives to the board of education all the advantages of open-market bidding, as well as adding flexibility to their planning. There is considerable variation in the extent to which boards of education use this device. Very often a greater use of it would be advantageous to the school district.

While it is desirable to anticipate and therefore prevent extra costs or transform them into unit-price extra costs, it should be recognized that even after a building program has been carefully planned, there are likely to be unforeseen circumstances where extra costs should be allowed. A modern school building is an increasingly complex structure. In the interval between the letting of the contracts and the completion of the building there may be improvements in materials which make changes desirable. This has often been true in the field of audio-visual education during recent years. If a desirable change can be more economically made during the construction than at a subsequent time, it may well be the part of wisdom to allow an extra cost.

Causes of Extra Costs Not Covered by Unit Prices

School officials should be chiefly concerned with this type of extra cost in their efforts to prevent excessive costs. The anticipation of these extras and their elimination is facilitated when one thinks in terms of their causes.

Space does not permit a complete discussion of the causes of extra costs.* Back of the more detailed causes in many instances there are certain general contributing causes.

School officials, in general, have not attached sufficient importance to the preliminary work of an educational nature which should be done before an architect is called in. The educational program, based in part upon the philosophy of education which the school accepts and in part upon a building survey, should be definitely determined. The sizes of classes, the room schedule needs, and the relationship of spaces to one another should be decided upon and the architect furnished with a complete statement of spaces as soon as he is commissioned. Before he begins work on his working plans, he should be furnished with complete information concerning any specialized layouts in the building.

The decisions concerning any broad policies involved in the foregoing should be made by the board of education. But the preparation of the complete statement of spaces and information concerning specialized layouts is properly the job of educators and not of architects or of a board of education committee or member. School administrators are usually not well qualified for this important task either by training or by experience. Where this is the case, specialists in the planning of school programs should be called in as educational consultants to make the building survey and to advise with the board of education,

* For a detailed discussion of the causes of extra costs and a check list for their prevention, see "Extra Costs and Incidental Costs in the Erection of School Buildings," by Frank Misner, Bureau of Publications, Teachers College, Columbia University, New York.

school administrators, and architects in the planning of the building. The need for such procedure is pointed out by the Director of the School Buildings and Grounds Division of the New York State Department of Education, who says:

"The cost of the building projected in the usual plan that is prepared by an architect without the aid of an educational consultant or school-building specialist and without a careful determination of the needs having been made, is in excess of the amount actually needed. There is usually in evidence much waste or limited usage space." *

The determination of the educational needs of the community as indicated above should be the first step in the building program. But in practice there are many instances where boards of education have preceded this step by determining the amount of money which is to be made available for building purposes by means of a bond issue. All subsequent steps are then unduly influenced by this one factor, the amount of money to be expended. Sometimes the architect who promises the most for this money is selected, thus putting a premium on the under-estimation of costs by the architect. This in turn is likely to necessitate a revision of plans after bids have been received. Such revision of plans tends to be hurried and to include only certain features of working drawings and specifications rather than a complete re-working of plans. This results in inconsistencies in the plans upon which the contracts are finally based, and necessitates extra costs.

In writing of this practice of boards of education, Dr. N. L. Engelhardt says: *

"School boards should not select an architect because he will guarantee cost of production in advance. Boards are too often deceived by architects who promise them more than they can possibly get for the money available, which frequently leads to re-advertising for bids, revising the drawings, etc. This is another reason for selecting a dependable architect instead of a plan." *

Another practice which eventually results in many extra costs is that of allowing insufficient time between the first step in the building program and the letting of the contracts. Architects frequently mention this as one of their chief difficulties in performing their services to boards of education. Such a condition tends to hurry the development of plans and specifications, resulting in inconsistencies and omissions.

Not only is the architect handicapped by this procedure, but the board of education itself will probably lack sufficient time to give mature consideration to many of the questions coming before it. This results in an undue number of changes as further reflection, after work has begun on the building, causes a change of mind or brings in new suggestions.

Extra costs not covered by unit prices will be relatively few if school officials follow the procedures set forth by the authorities on school-building programs. If the preliminary work of an educational nature is carefully and completely done, if competent architects and educational specialists are secured, if the board of education recognizes and respects the proper sphere of activity for itself, the architects, and the educators, and allows sufficient time for the development of plans and their careful checking, then there is small danger of a plague of extra costs. Such procedure will pay not only in lesser costs but in a building which gives greater value through more adequately meeting the educational needs of the community.

* Hixson, J. H.: "Report of the School Buildings and Grounds Division." From Twenty-sixth Annual Report of the Commissioner of Education of the State of New York, 1930; p. 229.

* Engelhardt, N. L.: "Obstacles Encountered by Architects in Securing Contracts for Planning School Buildings," Chapter XX in Thirty-third Yearbook of the National Society for the Study of Education, 1934.

The Selection of Woods for School-Building Construction

BY BRUCE W. ANGUS, B.SC.
TENAFLY, N. J.

"WOOD is wood" to most of us, and not until we become, or are about to become, consumers of the product do we begin to realize how many kinds of woods are commercially available, and how many and varied are the qualities of any particular kind. We find that this matter of quality, or grading, is particularly confusing. Not only are the terms new to us, but they are frequently misleading. Who, for example, would guess that "select" oak floors are not of the best quality but, if we are referring to plain sawed oak floors, are ranked by "clear" floors, and, if we are referring to quarter sawed oak floors, are ranked by "clear" (best quality) and "sap clear" (second quality), and that "select" quarter sawed oak floors are really of third-quality material!

And this is not the whole story; not only are terms misleading but they are often apparently contradictory. We order "first" grade hardwood trim and have delivered to us the best commercial quality. We order "first" grade maple flooring and receive the second-best quality ("clear," a special grade selected for uniformity of color heading the list). We order "No. 1 common" white pine and receive fourth-class material.

So great has been the confusion among dealers and purchasers that some years ago various producing organizations, distributors, wholesalers, retailers, engineers, architects, and contractors cooperated with the U. S. Department of Commerce and the U. S. Department of Agriculture to simplify and clarify the situation. As a result of these conferences, basic grading requirements (American Lumber Standards) were prepared by the Central Committee on Lumber Standards, and the producers were asked to adopt these standards. Because of long-established custom and understanding in the trade, some of the producers have felt that changes in existing classifications would only add confusion to confusion, and so have preferred to retain their inherited classifications. Other producers, recognizing that a change was desirable, have adopted the modifications proposed. Detailed information concerning the provisions of the American Lumber Standards is contained in U. S. Department of Commerce, Bureau of Standards, simplified Practice Recommendation R16-29.

In Department Bulletin No. 296 of the U. S. Department of Agriculture, which is a comprehensive treatise on the specifying and grading of woods, grading of lumber is defined as "the process of segregating lumber for shipment according to definite specifications." These specifications provide both buyers and sellers with a measure by which each can determine whether he is buying or selling full value.

The Difficulties of Grading

Lumber grades generally are determined by the number and location of certain recognized defects, such as knots, sap wood, pitch pockets, checks, and soundness. Each piece is considered and its grade determined by its general character, including the location and sum of all its defects and blemishes. In grading finishing woods, appearance is naturally of primary importance. In grading dimension and timbers, appearance is of secondary

FINISHING WOODS — SOFT WOODS — HARDWOODS

Basic Grades Proposed by the Forest Service (American Lumber Standards)	Idaho White Pine — Western Pine Ass'n	Northern White Pine, Norway Pine, Spruce, Balsam, Tamarack, Aspen — Northern Pine Manufacturers Ass'n	Hemlock, Tamarack — Northern Hemlock and Hardwood Mfrs. Ass'n	West Coast Hemlock — West Coast Lumbermen's Ass'n	Sitka Spruce — West Coast Lumbermen's Ass'n	Sugar Pine — Western Pine Ass'n	Ponderosa Pine — Western Pine Ass'n	Larch — Western Pine Ass'n	Douglas Fir — Western Pine Ass'n	Douglas Fir — West Coast Lumbermen's Ass'n	Cypress — Southern Cypress Mfrs. Ass'n	Long Leaf and Short Leaf Southern Pine — S.P.A.		Hardwoods — The National Hardwood Lumber Ass'n
SELECT GRADES — for finishes — Suitable natural — Grade A Practically free from all defects	Supreme	B and Better Select		B and Better	B and Better	1 and 2 Clear					Clear Heart A	A		First
SELECT GRADES — for finishes — Suitable natural — Grade B Allows a few small defects or blemishes							1 and 2 Clear			B and Better	B	B		Second
SELECT GRADES — for finishes — Suitable natural — Grade C Allows a limited no. of small defects and blemishes that can be covered with paint	Choice	C Select		C	C	C Select	C Select	C and Better	C and Better	C	C	C		Select
SELECT GRADES — for finishes — Suitable paint — Grade D Allows any number of defects and blemishes which do not detract from a finished appearance especially when painted	Quality	D Select, E Select, Barky Select	D and Better Finish	D	D	D Select	D Select	D	D	D	B			

NOTE: This chart does not include grading classifications for all uses of wood (such as railroad stock) but does include grades for a selection of stocks used for general building construction.

importance, and strength and soundness are of primary importance.

Grade groupings for each piece of material are determined by visual inspection by experienced graders at the producer's plant, who examine each piece and assign it to its proper group. The inspection, being visual, mathematical precision is impossible, and therefore a reasonable difference of opinion between inspectors must be recognized. As might be expected, it is sometimes difficult to determine the proper grade for borderline pieces, so that at times there are grounds for differences of opinion regarding a portion of grade assignments. In cases where a consumer feels that the material delivered to him is below grade, he is privileged to ask for a regrading. If this regrading determines that more than 5 per cent is below the grade noted, the consumer is entitled to the replacement of the portion of the shipment that is below grade, and the producer pays the cost of the regrading. If the regrading determines that less than 5 per cent is below grade, the consumer is not entitled to new material, and in this case he must pay the cost of the regrading.

To aid their campaign for uniformity, the Department of Agriculture in 1923 prepared a chart (see U. S. Department of Agriculture Bulletin No. 296, page 16) listing the "basic grades proposed by the Forest Service," and listing also the comparable classifications of a number of producing organizations. This Bulletin has since been amended, and to some extent superseded, by U. S. Department of Agriculture Circular No. 64, "How Lumber Is Graded," and a supplement thereto which includes information for specific uses of lumber. To those of us whose business it is to specify and buy woods for building purposes, these publications were a welcome addition to our files. We found, however, that their value could be increased, for our purpose, by revising the original chart somewhat and adding similar information for other kinds of wood and for other producers. For this reason the original chart included in

FLOORING

Hemlock & Tamarack Northern Hemlock and Hardwood Mfrs. Ass'n	Cypress Southern Cypress Mfrs. Ass'n	Long Leaf and Short Leaf Southern Pine Southern Pine Ass'n	Long Leaf and Short Leaf Southern Pine Southern Pine Ass'n	Long Leaf Southern Pine Southern Pine Ass'n	Short Leaf Southern Pine Southern Pine Ass'n	Maple, Beech and Birch Maple Flooring Mfrs. Ass'n	Quarter Sawed Oak National Oak Flooring Mfrs. Ass'n Southern Oak Flooring Industries	Plain Sawed Oak National Oak Flooring Mfrs. Ass'n Southern Oak Flooring Industries
D and Better	A	A	First Grade	All Heart	Dense Standard	*White Clear Maple	Clear	Clear
No.1	B	B	Second Grade	Select Merchantable		*Red Clear Beech	Sap Clear	Select
No.2	C	C	Third Grade	Standard	No.1	First	Select	No.1 Common
No.3	D	D		No.1	No.2	Second		No.2 Common
		No.1				*Special Grades		
		No.2						
		Standard flooring, tongued and grooved. Specify flat grain or edge grain. There is also a No.3 flat grain.	End matched flooring, tongued and grooved at both ends. Specify flat grain or edge grain. There is also a fourth grade flat grain.	Factory flooring not less than 2" thick and not less than 4" wide. Tongued and grooved or spliced.	Factory flooring not less than 2" thick and not less than 4" wide. Tongued and grooved or spliced.			

BOARDS AND STRIPS
COMMON GRADES

Basic Grades Proposed by the ForestService (American Lumber Standards)	Idaho White Pine Western Pine Ass'n	Northern White Pine Norway Pine, Spruce Balsam, Tamarack, Aspen Northern Pine Manufacturers Ass'n	Hemlock, Tamarack Northern Hemlock and Hardwood Mfrs Ass'n	West Coast Hemlock West Coast Lumbermen's Ass'n	Sitka Spruce West Coast Lumbermen's Ass'n	Sugar Pine Western Pine Ass'n	Ponderosa Pine Western Pine Ass'n	Larch Western Pine Ass'n	Douglas Fir Western Pine Ass'n	Douglas Fir West Coast Lumbermen's Ass'n	Cypress Southern Cypress Mfrs. Ass'n	Long Leaf and Short Leaf Southern Pine S.P.A.
No.1 COMMON Sound and tight knotted stock. Size of defects and blemishes limited. Watertight Lumber.	Colonial	No.1	No.1	Select Merchantable	Select Merchantable	No.1	No.1	No.1 & No.2	No.1 & No.2	Select Merchantable	No.1	No.1
No.2 COMMON Allows large and coarse defects. Gratistight lumber.	Sterling	No.2	No.2 Merchantable 50% No.1 50% No.2	No.1	No.1	No.2	No.2	No.1 & No.2		No.1	No.2	No.2
No.3 COMMON Allows larger and coarser defects than number 2 and occasional knotholes. 75% as good as No.2	Standard	No.3	No.3	No.2	No.2	No.3	No.3	No.3	No.3	No.2	No.3	No.3
No.4 COMMON Low quality lumber containing the coarsest defects such as rot and holes. 50% as good as No.2	Utility	No.4	No.4	No.3	No.3	No.4	No.4	No.4	No.4	No.3	No.4	No.4
No.5 COMMON Must hold together under ordinary handling.	Industrial	No.5	No.5			No.5	No.5				Peck	

PENETRATING SOME VALUE — SUITABLE WITHOUT VALUE

NOTE.—"Merchantable" is a separate grade between No. 1 and No. 2.

FRAMING LUMBER

Northern White Pine Norway Pine, Spruce, Balsam, Tamarack, Aspen Northern Pine Manufacturers Ass'n	Hemlock and Tamarack Northern Hemlock and Hardwood Manufacturers Ass'n			West Coast Hemlock West Coast Lumbermen's Ass'n	Douglas Fir West Coast Lumbermen's Ass'n	Douglas Fir West Coast Lumbermen's Ass'n	Douglas Fir Western Pine Ass'n	Douglas Fir Western Pine Ass'n	Idaho White Pine Western Pine Ass'n	Sugar Pine Western Pine Ass'n	Ponderosa Pine Western Pine Ass'n	Larch Western Pine Ass'n	Larch Western Pine Ass'n	Cypress Southern Cypress Mfrs. Ass'n
Select Common No.1 Dimension & Timbers No.2 Dimension & Timbers No.3 Dimension	No.1 Common Dimension No.2 Common Dimension Merchantable Dimension 50% No.1 50% No.2 No.3 Common Dimension No.4 Common Dimension No.5 Common Dimension	No.1 Common 4"to 8" and wider Plank and 6" x 10" and wider plank No.2 etc. Grades for heavy joists larger than dimension and smaller or wider than timbers	No.1 Common No.2 Common Grades for heavy timbers, 4"x4", 4"x6", 6"x6", 6"x8", grgr	Select Merchantable No.1 No.2 No.3 Grades for dimension, framing, joists and small timbers 2" to 4" thick	Select Merchantable No.1 No.2 No.3 Grades for timbers, posts, and stringers, 6"x8" and larger. The "select structural" grade is the highest structural grade for use in construction.	Select Merchantable No.1 No.2 No.3 Grades for dimension, framing, joists and timbers. There is also a "select structural" grade for use in the highest type of construction.	No.1 Dimension No.2 Dimension No.3 Dimension Grades for dimension material	Select Structural Structural Common Structural Grades, posts, timbers, joists, and planks	No.1 Dimension No.2 Dimension No.3 Dimension Grades for dimension and timbers	No.1 Dimension No.2 Dimension No.3 Dimension Grades for dimension and timbers	No.1 Dimension No.2 Dimension No.3 Dimension Grades for dimension and timbers	No.1 Dimension No.2 Dimension No.3 Dimension Grades for dimension material	Select Structural Structural Common Structural Grades for posts, timbers, joists, and planks	Select Structural Heart Common Structural Grades for joists, plank, beams, stringers, posts, and timbers

FRAMING LUMBER (CONTINUED)

Long Leaf Yellow Pine Southern Pine Association				Short Leaf Yellow Pine Southern Pine Association			
Select Structural Prime Structural Merchantable Structural Structural Square Edge and Sound No.1 Structural Grades for timbers 6"x6" and larger	No.1 Grades for small timbers from 3"x3" to and including 6"x6"	Prime Structural Merchantable Structural Structural Square Edge and Sound Grades for joists and planks 2" to 5" thick and 4" to 14" wide	No.1 Dimension No.2 Dimension No.3 Dimension Grades for "dimension" material, 2" thick, and 4", 6", 8", 10", and 12" wide	Dense Select Structural Dense Structural Dense Structural Square Edge and Sound Dense No.1 Structural Grades for timbers 6"x6" and larger	No.1 Dense No.2 No.3 Grades for small timbers from 3"x3" to and including 6"x6"	Dense Structural Dense Structural Square Edge and Sound Dense No.1 Structural Grades for joists and planks 2" to 5" thick and 4" to 14" wide	No.1 Dense Dimension No.1 Dimension No.2 Dimension No.3 Dimension Grades for "dimension" material 2" thick, and 4", 6", 8", 10", and 12" wide

Bulletin No. 296 has been revised, brought up to date, and enlarged to make the charts which form the basis of this article.

The accompanying reproductions are believed to give the correct grading designations of the principal producers, and are arranged so that one can tell at a glance the comparable grades of the various kinds of woods, and also their relation to the proposed basic grades. In addition, it gives in a general way the recommended uses for the several grades. A reasonably accurate visualization of the material allowed in each grade may be obtained from a study of the grade specifications outlined in the column headed "Basic Grades Proposed by the Forest Service" which formed a part of the Department's original chart.

In order to safeguard the interests of the consumer, many of the producers stamp each piece of material, or label each bundle leaving their plants, with its proper designation, using not only their grade term, but using also distinguishing colors for the several grades so that they may be readily recognized.

Before closing this article, it is well to draw attention to the care and handling of material for interior trim and flooring. Many producers kiln-dry this kind of material, so that when it leaves their plant it has a moisture content of between 5 and 12 per cent, and is packed so as not to pick up appreciable additional moisture in transit. Consumers should be careful to store such kiln-dried material in dry places and not install it until after plastering and other work requiring water for its execution is completed and dried out. If these precautions are not taken and the wood is allowed to absorb moisture before being put in place, and before being protected on both sides with paint or varnish, it will swell across the grain. When the building is completed and the heat is on, this excess moisture will be driven out, causing the wood to shrink and crack and to open at the joints. It should be understood that such conditions arise not because of defects in the wood, but rather because of improper handling of the lumber.

A Bibliography of Fifty Outstanding Books on School and College Buildings and Allied Topics*

BY WILLIAM J. LOWRY

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TEACHERS COLLEGE, COLUMBIA UNIVERSITY

Books have been included in this list which are relatively recent in publication and which should prove to be helpful to educational executives, architects, and planners in the development and maintenance of superior educational structures.

Our Cities Today and Tomorrow.—By T. K. and H. V. Hubbard. Harvard University Press, Cambridge, Mass., 1929. 389 pp. $5.00.

This book touches the schools only incidentally as one element in an embracing city planning scheme, but the location of school sites, the type of architecture employed in construction, and the utilization of school playgrounds for community use, are all shown as important phases in the correlation of all civic construction enterprises.

Planning Residence Halls. — By Harriet Hayes. Bureau of Publications, Teachers College, Columbia University. 1932. 247 pp. $2.25.

A handbook for the use of college officers and members of building committees. Part One includes the essential details of preliminary considerations; Part Two develops the desirable physical facilities to be included; Part Three sets up provisions for safety and general welfare with reference to heating, ventilating, and lighting.

Planning School Building Programs.—By N. L. Engelhardt and Fred Engelhardt. Bureau of Publications, Teachers College, Columbia University, New York. 1930. 570 pp. $5.00.

A comprehensive treatise on all phases of school plant analysis. This text treats critically and completely of the techniques and principles involved in plant planning. It covers such items as site selection, cost of school sites, city planning and the plant program, architectural service and the building program, school-building costs, financing and cost of school-building programs, and many other phases of the work.

Public Elementary School Plant.—By Charles L. Spain, Arthur B. Moehlman, and Fred W. Frostic. Rand McNally and Company, New York. 1930. 602 pp. $4.00.

The authors approach the problem from the standpoint of the basic educational policies in terms of which all school-plant planning must proceed. Elementary education is considered in three phases: (1) traditional; (2) transitional; and (3) the probable school of the future. Methods of determining space requirements and the relative physical efficiency of plan types are followed by a discussion of the technique of designing an elementary school plant. The text is generously interspersed with plates and floor plans illustrating the factors discussed.

Public School Plant Program.—By Arthur B. Moehlman. Rand, McNally & Co., New York. 1929. 405 pp. $3.00.

This text presents authoritatively the principles underlying the organization and administration of school plant programs. A practical technique for appraising the present plant and determining the needs of the ultimate plant in a given school situation is also presented.

Public School Plumbing Equipment.—By Minor W. Thomas. Bureau of Publications, Teachers College, Columbia University. 1928. 128 pp. $1.60.

This book treats of the sanitary and practical aspects of school plumbing from the viewpoint of the superintendent of schools and sets up criteria for judging good plumbing equipment to guide one in the selection and arrangement of such equipment in a modern school building.

Report of the Survey of Schools of Chicago, Ill., Vol. IV. George D. Strayer, Director.—Housing the Schools, by F. W. Hart and N. L. Engelhardt; The Operation of the School Plant, by George F. Womrath. Bureau of Publications, Teachers College, Columbia University. 1932. 315 pp. 75¢.

This survey report gives an accurate picture of the schoolhousing situation in America's second greatest city and describes fully how the plant has been operated. Its recommendations embody "what not to do" as well as "what to do," and it should be studied in every city school system.

Rural Schoolhouses, School Grounds, and Their Equipment.—By F. B. Dresslar and Haskell Pruett. Bureau of Education, U. S. Department of the Interior, Washington, D. C., Bulletin No. 21, 1930. 14 pp.

Those who have to deal with rural school design and construction will find this bulletin a rich mine of information regarding function, location, planning and adapting. It is abundantly illustrated and contains suggestive floor plans and specifications.

Safeguarding the School Board's Purchase of Architects' Working Drawings.—By A. M. Proctor. Bureau of Publications, Teachers College, Columbia University. 1931. 138 pp. $2.10.

A study showing the inadequacies of laws and practices with respect to working drawings for school buildings. The author includes a check-list growing out of his study of these inadequacies which will assist school boards and superintendents of schools in their analysis of working drawings and in safeguarding their purchases of architectural service.

School Architecture: Principles and Practices.—By John J. Donovan and others. Macmillan Co., New York. 1921. 724 pp. $20.00.

Mr. Donovan and his collaborators in a comprehensive treatise have clearly indicated desirable architectural practices in modern school erection. Building planning, construction costs, departmental equipment, heating and ventilation, and electrical installations, are a few of the topics that provide a wide fund of information. This volume is profusely illustrated with pictures of all types of buildings, various types of rooms, laboratories and offices, and with suggestive floor plans.

School Building Management.—By C. E. Reeves and H. S. Ganders. Bureau of Publications, Teachers College, Columbia University. 1928. 395 pp. $3.75.

This is the first comprehensive book that has yet become available that covers the care and operation of school buildings. It is a manual and book of reference for those who are responsible for the maintenance of school-building conditions at a high level. It gives standards for measuring the efficiency of operation, and concrete help that will facilitate the work of janitor-engineers and other employees about a school plant.

School Building Problems.—By George D. Strayer and N. L. Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1927. 500 pp. $5.25.

This book brings together a collection of the school-building problems which superintendents of schools are required to solve. The topics covered include population studies, the location of school buildings, the selection of architects, adequate plans and specifications, school-building contracts, the planning of new high and elementary schools, equipment planning, and financing new buildings and equipment.

School Building Programs in American Cities.—By N. L. Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1928. 560 pp. $5.00.

This volume presents a cross-section study of school-building conditions in the United States—North, South, East, and West. It illustrates clearly by definite reference to specific cases and places how school-building

* The aid of Dr. John W. Sahlstrom, Superintendent of Schools at Elmira Heights, N. Y., Dr. William B. Featherstone, Assistant Professor of Education, Teachers College, Columbia University, S. J. Smith, Assistant Superintendent of Schools, New Rochelle, N. Y., and others in the preparation of this list is acknowledged.

programs have been developed. The variety of situations presented enables a superintendent to adapt the specific methods of study to his own local conditions.

A Bibliography of School Buildings, Grounds, and Equipment.—Bureau of Cooperative Research, Indiana University, Bloomington, Ind. Part I, by Henry L. Smith and Leo M. Chamberlain, 326 pp., 1928, 75¢.; Part II, by Henry L. Smith and Forest R. Noffsinger, 182 pp., 1933, 50¢.; Part III, by Henry L. Smith and Forest R. Noffsinger, 130 pp., 1933, 50¢.

Part I is a comprehensive bibliography in the field. The two latter bulletins include additional references necessary to bring Part I up to April, 1933. The two bulletins should be used in conjunction with Part I, as there is no overlapping of references.

A Standard State Schoolhousing Code.—By Frank W. Hart. C. F. Williams & Son, Inc., Albany, N. Y. 1924. 172 pp.

This publication presents the building codes of all the states in tabular, easy-reference form and gives a complete set of standard forms which can be utilized for orderly and efficient control of a school-building program from inception to completion. A new edition is needed.

Architectural Planning of the American College.—By J. Frederick Larson and Archie M. Palmer. McGraw-Hill Book Co., New York. 1933. 181 pp. $2.00.

This significant volume on the planning of the college campus and the various types of college buildings will be found helpful to college officers and to architects. The various chapters treat of the styles in college architecture, the selection, service and compensation of the architect, campus planning, and the details of spaces devoted to administration, class work, laboratories, student residences, and student recreation. It has been produced by the Association of American Colleges. This vouches for the value of the materials included within its covers.

Buildings and Equipment for Home Economics.—By Melvin Brodshaug. Bureau of Publications, Teachers College, Columbia University. 1931.

A very thorough analysis of the planning of home economics suites. The purpose of the investigation was to evaluate present practice and to determine as objectively as possible the characteristics of well-designed home economics plants. Building problems, space allotments, and equipment are given extensive treatment. The suggestions arising from the study should be valuable to those responsible for the planning of home economics departments.

Campus Standards for Country Day and Boarding Schools.—By G. D. Strayer, N. L. Engelhardt, and T. C. Burton. Bureau of Publications, Teachers College, Columbia University. 1930. 51 pp. $1.00.

The authors have developed a campus score card for country day and boarding schools. It lists more than 70 separate items that contribute toward the most desirable campus. The score card is followed by a description of what should be considered an ideal situation for each item. The arrangement of the booklet is such that a very fair appraisal may be made of any campus.

Check List Materials for Public School Building Specifications.—By Lee Byrne. Bureau of Publications, Teachers College, Columbia University. 1931. $2.35.

A scientific analysis of a large number of building specifications which has resulted in a check-list of the items which should be included in such a document.

College Architecture in America.—By Charles Z. Klauder, and Herbert C. Wise. Charles Scribner's Sons, New York. 1929. 301 pp. $5.00.

Even though this book does not purport to be a book of plans, floor plans or development plans appear on some sixty pages of the book. There are equally as many pages devoted to representative samples of the types of architecture existing on the American college campus. This book presents a comprehensive discussion of the present-day theory and practice of college architecture, which is distinctly American, adapted to climate, environment, and other physical conditions, as well as to the rapidly advancing methods of collegiate education.

Construction et Aménagement des Écoles Maternelles.—By Mlle. S. Brès. Published by Delagrave, 15, Rue Soufflot, Paris. 44 pp.; illustrations and diagrams. (No date.)

A great deal of pertinent information regarding infant or nursery schools has been supplied in this little volume by a French authority. Construction and equipment of this increasingly popular type of school are fully described. A typewritten translation by Walter M. Wallack is available.

Das Berliner Schulwesen.—By Jens Nydahl. Wiegandt and Grieben, Berlin, Germany. 1928. 607 pp.

A very comprehensive report on school methods, school curriculum, and other educational aspects of the school problem of this city. It contains many pictures of school activities and educational achievements. A section of this report is devoted to plans of school buildings as well as photographs of recently constructed buildings in Berlin.

Der Neue Schulbau.—By Julius Vischer. Julius Hoffman, Stuttgart, Germany. 1931. 102 pp.

The outstanding volume available in Europe illustrating the new schools of Germany, Holland, Switzerland, England, Denmark, and America. Contains many photographic illustrations and plates.

Desirable Physical Facilities for an Activity Program.—By Frank M. Long. Bureau of Publications, Teachers College, Columbia University. 1933. $1.60.

An intensive study of twenty progressive schools to determine what physical facilities were being provided for kindergarten and the first six grades of the elementary school. This study included not only the buildings, but also the equipment and grounds. Classroom standards are derived to conform to changes which are being advanced for elementary school procedures.

Écoles.—By Poulain Roger. Vincent Freal et Cie, 4 Rue des Beaux Arts, Paris, France.

Includes many illustrations of recently erected schools in France and elsewhere. It presents splendid illustrations, especially of exteriors.

Edifici Scolastici Italiani, Primari E Secondari.—By Luigi L. Secchi, Ulrico Hoepli, Milano. 1927. 228 pp. 52 plates.

This publication presents a complete treatment of Italian school buildings and equipment. It is particularly interesting for its presentation of the Italian style of architecture, which is so closely akin to our "California" type. The plates are large and well drawn.

Efficient Business Administration of Public Schools.—By George F. Womrath. Bruce Publishing Co., Milwaukee, Wis. 1932. 461 pp.

A general work on school administration which concerns itself largely with problems of buildings—their location, construction, operation, equipment and maintenance—and containing a valuable chapter on portable schoolhouses, is the contribution of a practical educator, an authority in the field.

Extra Costs and Incidental Costs in the Erection of School Buildings.—By Frank M. Misner. Bureau of Publications, Teachers College, Columbia University. 1934. 79 pp. $1.60.

The only scientific study of so-called "extra" costs involved in the erection of school buildings. The author presents a check-list which will enable the architect to reduce the percentage of "extras" resulting from failure to consider all elements of planning.

For Better Schoolhouses.—By Fletcher B. Dresslar, S. L. Smith, Haskell Pruett, and others. Interstate School Building Service, George Peabody College, Nashville, Tenn. 1929. First edition exhausted.

This is a book of perspective sketches of school buildings, floor plans, perspectives of school grounds, suggestive specifications, and contract forms. The buildings represented are classified according to teacher capacity, ranging from one to fourteen teachers, with the greater space accorded the one-, two-, three-, and four-teacher schools. One section is devoted to community houses, teacherages and other special buildings.

Furnishings and Equipment for Residence Halls.—By Mary De Garmo Bryan and Etta M. Hanby. Bureau of Publications, Teachers College, Columbia University. 1933. 95 pp. $1.05.

A consideration of the many factors which enter into the selection of furnishings and equipment for residence halls. The size of the hall, type of resident, service to be rendered, rate to be charged, and the funds available, are considered. Emphasis is placed on the careful cooperation of the architect, the committee or staff members concerned with the interior decoration, and those responsible for the management of the building.

Grade School Buildings.—By William Conrad and William George Bruce. 2 vols. Bruce Publishing Co., Milwaukee, Wis. 1925. 400 pp.

These two volumes consist of articles and illustrations which appeared originally in the *American School Board Journal*. They present the work of some of the outstanding school architects in the United States and contribute many valuable suggestions relating to school-building planning and construction. Excellently illustrated.

High School Buildings and Grounds. A Report of the Commission on the Reorganization of Secondary

Education, appointed by the National Education Association.—United States Bureau of Education, Bulletin 1922, No. 23. 49 pp.

This bulletin treats briefly and clearly certain school-building requirements, such as maximum safety, adequate lighting, good ventilation, practical economy and architectural beauty, which are common to all schools. A section of this treatise deals with the building problems of the small high school.

Improvement in the Maintenance of Public School Buildings.—By H. M. Schwartz. Bureau of Publications, Teachers College, Columbia University. 1926. 74 pp.

Those who are desirous of ascertaining the probability of repairs in various elements of school buildings and the effect upon costs when repairs are made at certain times will find much information in this study.

L'Architecture D'Audjourd'hui—Écoles. A compilation published by L'Architecture D'Aujourd'hui, 5, Rue Bartholdi, Boulogne-Sur-Seine, France. May, 1934.

Those who desire acquaintance with modern European school architecture and school equipment should consult this lavishly illustrated volume, which is one of a series on types of French buildings. It will astound the average American who believes that this country displays the last word in modernity of educational plants.

Measurement and Interpretation of School Building Utilization.—By Edgar L. Morphet. Bureau of Publications, Teachers College, Columbia University. 1927. 102 pp. $1.60.

The author has analyzed buildings which are reported by school principals as "overcrowded." He has discovered the degree of utilization for each type of educational space and has set up criteria against which the utilization of plant may be measured.

Modern School Buildings, Elementary and Secondary.—By Sir Felix Clay. B. T. Batsford, Ltd., 94 High Holborn, London. 3rd ed., 1929. 208 pp.

The English viewpoint and practice in regard to school-building design, situation and construction are adequately presented in this book, which is well illustrated with photographs of notable buildings and interiors and with many drawings of floor plans and details.

School Buildings of Today and Tomorrow.—By W. K. Harrison and C. E. Dobbin. Architectural Book Publishing Company, Inc., New York. 1931. 233 pp. $16.50.

Part I of this book describes and discusses the design of the school building of yesterday and the school of tomorrow. Part II presents plans and illustrations of a group of modern schools in foreign countries. Part III discusses the advantages of standardization and submits plans and illustrations to show how this system operates in the New York schools. The volume is replete with attractive illustrations, detailed plans and diagrams.

School Buildings, Grounds, Equipment, Apparatus, and Supplies.—T. C. Holy, Chairman. *Review of Educational Research*, December. 1932. pp. 343-441. American Educational Research Association. Washington, D. C.

A comprehensive review of the techniques and procedures followed in school-building surveys, in site selection, and in the planning and equipment of school buildings. Direct references are made to research volumes, building surveys, and other studies that have bearing upon this field. This comprehensive survey will bring the reader up to date with reference to the literature on school buildings and the contributions that each study has made to this field.

School Ventilation — Principles and Practices.—New York Commission on Ventilation. Bureau of Publications, Teachers College, Columbia University. 1931. 73 pp. $1.00.

Final contribution of the Commission, whose work was financed by the Milbank Memorial Fund, 1913-1923, 1926-1929. The summary of conclusions is most significant in that it finds no justification for the extensive mechanical equipment so generally required by law and practice.

Some Administrative Problems of the High School Cafeteria.—By Willard S. Ford. Bureau of Publications, Teachers College, Columbia University. 1926. 191 pp.

This study suggests layouts for school cafeterias and sets up standards for determining room sizes and space relations.

Some Code Controls of School Building Construction in American Cities.—By John W. Sahlstrom. Bureau of Publications. Teachers College, Columbia University. 1933. $1.60.

A significant investigation of the effects of municipal building codes upon the construction of school buildings. It relates the particular needs of the school to technical regulation of construction. Its purpose is to assist responsible school officials in the improvement of municipal and state building codes with respect to those aspects that affect school-building construction or add unnecessarily to school-building costs.

Standards for Elementary School Buildings (eighth and revised edition).—By G. D. Strayer and N. L. Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1933. 181 pp. $1.70.

A revision and enlargement of the earlier Standards in the light of recent research and advanced thought on the subject. The Standards and the Score Card constitute an indispensable instrument (1) in the surveys of existing school-building conditions preparatory to the formulation of an adequate building program, and (2) to help boards of education, superintendents of schools, and architects in checking the adequacy of plans for new buildings.

Standards for High School Buildings.—By G. D. Strayer and N. L. Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1924. 95 pp.

Gives score card for buildings, standards of construction, methods of evaluating, and an explanation of use of score card. $1.05.

Standards for Junior High School Buildings.—By N. L. Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1932. 155 pp. $1.60.

The latest of the series of standards for public school buildings establishes standards for physical facilities to be included in the modern junior high school building. The author indicates how educational programs and educational methods affect the planning of junior high schools.

Survey Data Book and Standards for Operation and Maintenance of Physical Plant in Colleges and Universities.—By N. L. Engelhardt, C. E. Reeves, and Parl West. Bureau of Publications, Teachers College, Columbia University. 1935. In mimeographed form. 148 pp. $1.00.

This is the first volume that has been prepared on the operation and maintenance of physical plant in colleges and universities. The information included here can be used to train the operation and maintenance staff now in service or to make a comprehensive survey of conditions to be found in any one single plant.

Survey Field Book for the Analysis of a High School Building.—By N. L. Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1931. 45 pp. 55¢.

Permits of the analysis and detailed study of plans for modern high school buildings or of existing high school plants.

The College Library Building: Its Planning and Equipment.—James T. Gerould. Charles Scribner's Sons, New York. 1932. 116 pp. $2.00.

A handbook of principles and standards to assist in the interpretation of the needs preparatory to the planning of an effective and flexible college library building.

The Location of City School Plants.—By L. Leland Dudley. Harvard Bulletins in Education No. 14. Harvard University Press, Cambridge, Mass. 1929. 130 pp.

A well-organized monograph which has drawn from current school-building surveys such pertinent information and techniques necessary to the solution of school planning problems. This volume offers sound criteria for school-plant planning in the selection of desirable school sites.

The New World Architecture.—By Sheldon Cheney. Longmans, Green & Co. New York. 1930. 404 pp. $10.00.

Mr. Cheney has given us a handsome and profusely illustrated volume devoted to modern buildings and their treatment which includes some school structures among those illustrated and described. His explanation of modern design, comparisons of older types with the new, and the projection of his ideas into the future, make this a most entertaining and valuable volume.

The Planning and Construction of School Buildings.—The Thirty-Third Yearbook of the National Society for the Study of Education. N. L. Engelhardt, Chairman. Public School Pub. Co., Bloomington, Ill., 1934. $2.50.

A comprehensive study of the field of school-building planning and construction by leaders in the educational field. It reflects the most recent thought and practice on the subject. Emphasis has been placed upon those difficulties involved in school-building planning for which the board of education and the superintendent of schools frequently have sought in vain for solution. Chapters dealing with the selection of the school architect, extra costs in school-building instruction, forms of architects' contracts, the character of working drawings, specifications and the like are of particular interest to architects.

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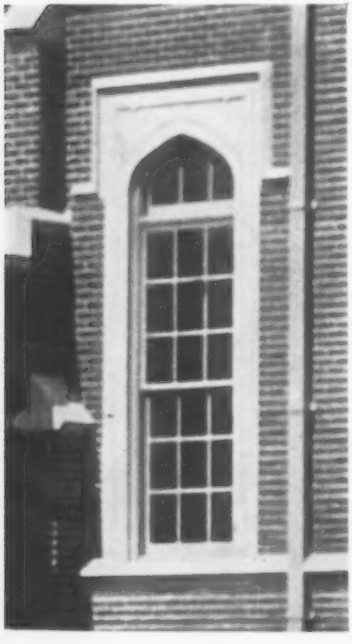

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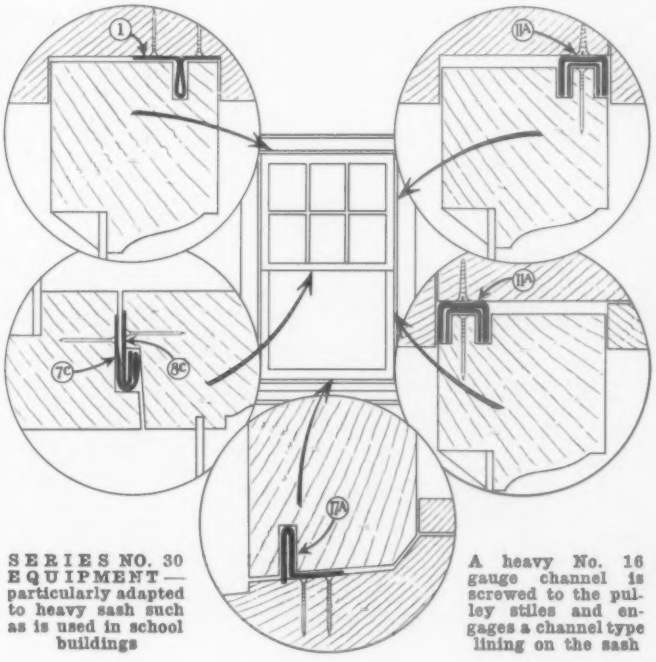

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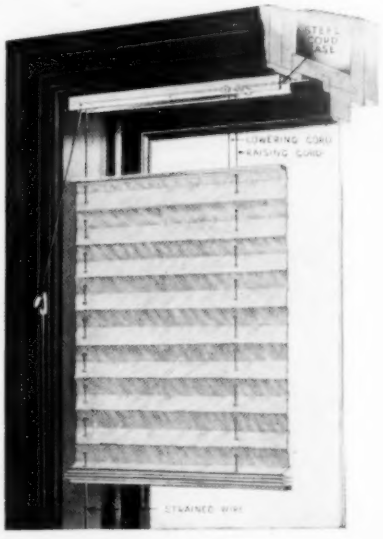

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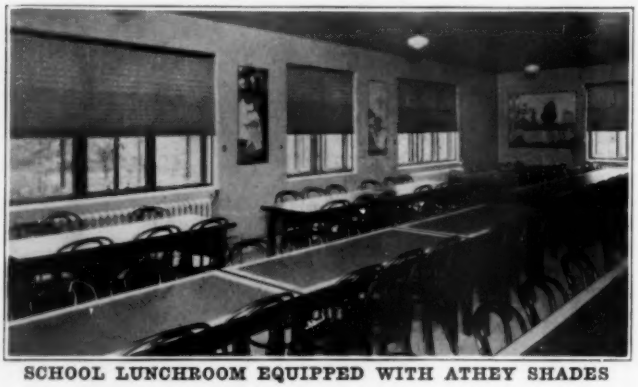

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Athey Cloth-Lined Metal Weatherstrips have important advantages over ordinary metal weatherstrip:

First: Their cloth-to-metal contact eliminates all air leakage — and drafts and dust are effectually kept out as well.

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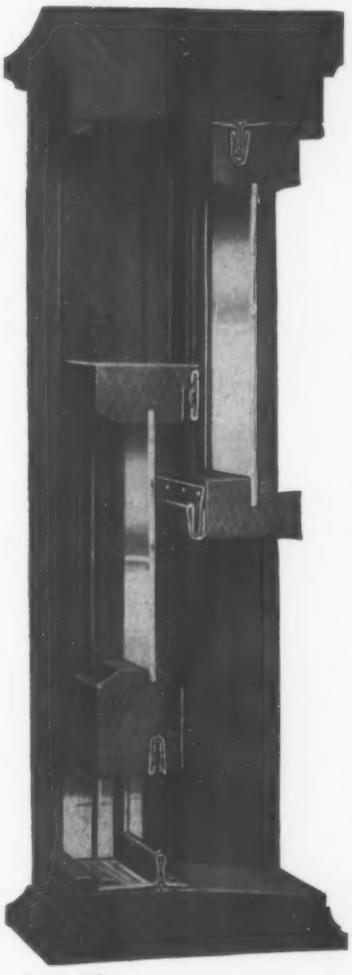

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These and many other schools find Athey Weatherstripping most economical because:

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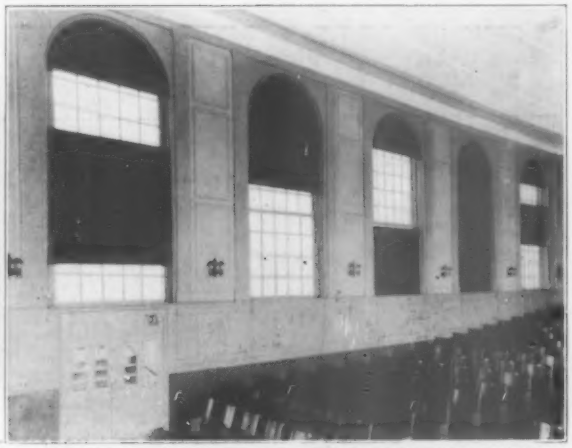

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Our Walls can be finished in almost any way desired. The illustration below shows an immense wall finished on one side for permanent stage scene and on the other side to take the rough usage of a gymnasium.

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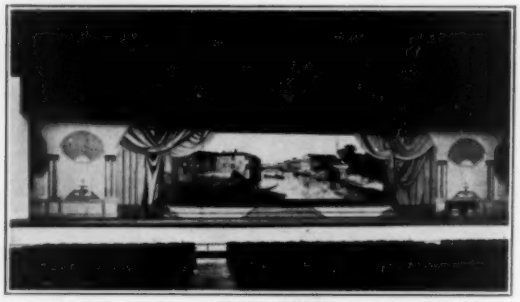
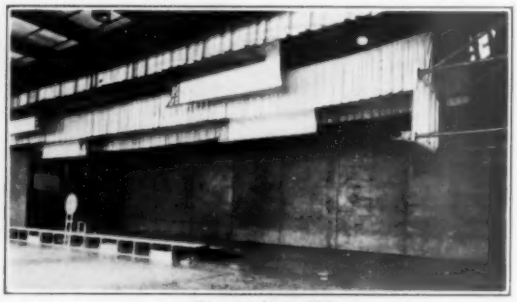


Stage Side



Gymnasium Side

MOTOR OPERATED BLEACHERS

Motor Operated Bleachers have become very popular in gymnasiums of schools and colleges, as the bleachers can be pulled back against the wall giving considerably more gym floor space for practicing. The bleachers can be made in any size to fit the special building conditions and seating requirements.

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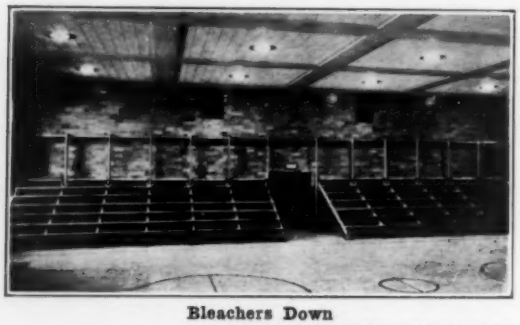
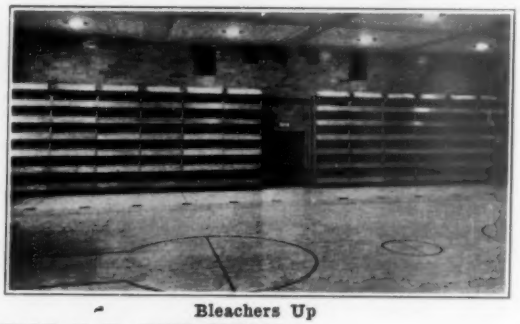


Bleachers Down



Bleachers Up

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Sectional poles are constructed from copper bearing steel tubing or steel pipe. Sections shrunk and welded together so that all joints are water tight. Field joints where required can be readily caulked or welded in the field.

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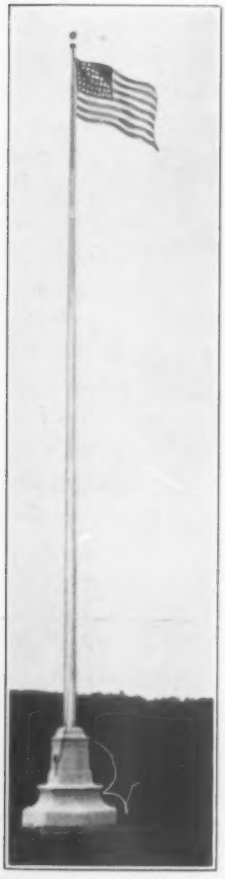

B-D Continuous Tapered Flag Pole at Veterans Hospital, Rutland Heights

88 ft. 0 in. overall, 15 in. diameter at base and 5 in. diameter at tip, equipped with bonnet type halyard top and 12 in. gold leafed copper ball.

B-D Easy Access Base contains a worm gear which turns a quadrant secured to bottom of pole which can be applied to any of these poles. Poles can be raised or lowered in a few minutes.

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Illinois: John Deere School, East Moline.

Massachusetts: St. Patrick's School, Stoneham; Annie E. Warren School, Wellesley; Nevada School, Newton; St. Mary's School, Dedham; Tewksbury High School, Tewksbury.

Minnesota: Medical Arts Building, Duluth.

Michigan: Saranac High School, Saranac.

New York: West Albany School, Albany; Clizbe Avenue Grade School, Amsterdam; Senior High School, Amsterdam; Auburn Senior High School, Auburn; Johnson City School, Johnson City.

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Utah: Bingham High School, Copperton.

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Curtain Partly Closed

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Curtains can be arranged to operate individually or collectively.

To obtain the best results we should work with the Architect when preparing his plans.

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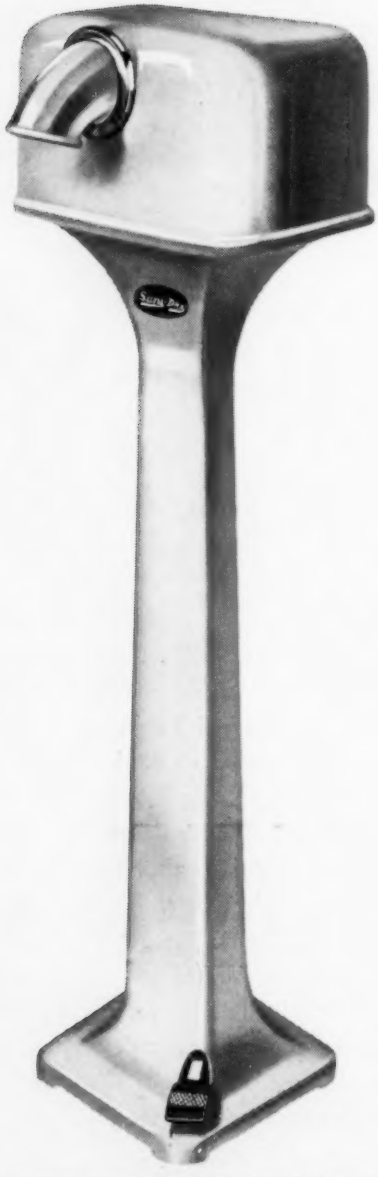

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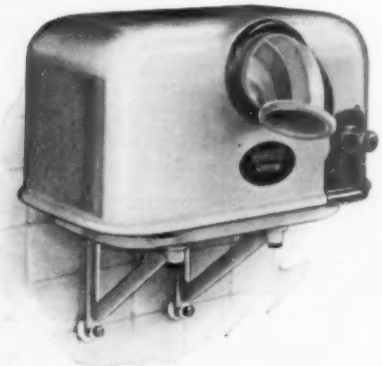
with
SANI-DRI ELECTRIC DRIER

The function of SANI-DRI is to furnish a continuously dependable, sanitary drying service. But SANI-DRI does more than that—it provides what users term "washroom control": Sanitation, drying service expense, washroom cleanliness, and uninterrupted service are *automatically controlled* where SANI-DRI is installed. Users report that complete installations of SANI-DRI invariably result in cleaner washrooms because of the disappearance of towel-litter. Janitorial service is reduced as there are no towel-cabinets to keep filled or soiled towels to remove. Towel-bill savings of 60 to 90% soon write off the moderate cost of SANI-DRI and these savings continue for many years.

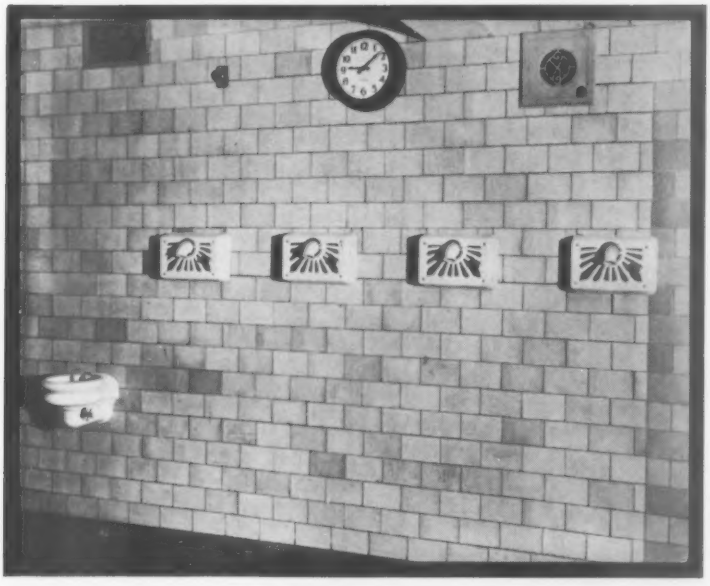
Your inquiry relative to the application of SANI-DRI to the solution of your washroom problem will receive our prompt attention.



The SF-W "Aristocrat" of HAIR DRIERS upholds its title by virtue of its quality, speed and performance. Equipped with automatic cut-off it dries *thoroughly in one to three minutes*

These Pictures Illustrate
the Semi-flush Recess Wall Model SANI-DRI

Adapted to both Hair Drying and Hand and Face Drying. Used in new Construction or Modernization



A battery of Semi-flush RW-A Model SANI-DRI HAIR DRIERS equipped with automatic timing switch, serving the new Deerfield-Shields High School at Lake Forest, Illinois

A washroom serviced by the Semi-flush RW-F Model, equipped with foot pedal operated switch for hand and face drying—providing automatic "WASHROOM CONTROL"

THE AMERICAN SCHOOL AND UNIVERSITY

CONGOLEUM-NAIRN INC.

General Office: Kearny, New Jersey

SEALEX *Linoleum Floors* *and* **SEALEX** *Wall-Covering*

Thousands of schools, including many of America's best known colleges and universities, have installed Sealex Linoleum Floors. As manufactured by Congoleum-Nairn, world's largest producer of smooth-surface floor-covering, Sealex possesses certain unique advantages that make it a first choice in the school field.

Sealex is resilient; therefore quiet and comfortable underfoot.

It is also a highly sanitary and easy-to-clean flooring. For its smooth surface contains no dirt-catching and dust-generating cracks or joints.

Furthermore, Sealex is built to withstand many years of wear without expensive refinishing. Records show that during its long period of service, Sealex actually pays for itself in maintenance economies.

There are Sealex Floors appropriate for every type of school interior. And any floor design, ranging from colorful insets for younger pupils' classrooms to classic or school emblems fitting for the finest university, may be cut to order at moderate cost in Sealex.

Sealex Veltone Linoleum, one of the most popular resilient floorings, serves as a background for nursery rhyme characters and letters of the alphabet in this designed-to-order kindergarten floor. Colorful Sealex Floors afford a practical means of making younger pupils' classrooms cheerful and attractive.

Concentration on studies is aided by this resilient, noise-subduing floor of Sealex Treadlite Tile in the library of the Topeka, Kansas, High School.

Without seams or joints in its smooth surface, this floor of Sealex Battleship Linoleum assures the cleanliness and freedom from dust necessary in school areas.

Another material highly recommended for school use is the linoleum-type Sealex Wall-Covering. It offers a wide variety of colorings, is washable and sanitary, and never has to be "gone-over."

Sealex Floors and Walls are equally suitable for remodeling or for completing new school interiors. When installed by authorized contractors located in principal cities, both materials and workmanship are backed by Guaranty Bonds.

SCHOOL SUPERINTENDENTS—Write for our newest "Resilient Floors" catalog. This complete up-to-date catalog of information about floors of the linoleum or cork composition type will be sent without charge to you.

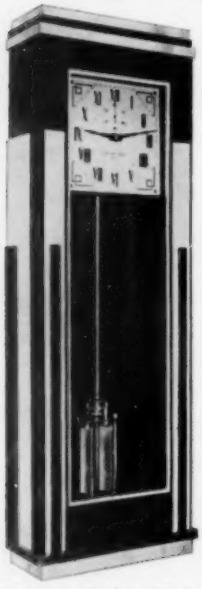
The ideal gymnasium floor—splinter-proof, germ-free Sealex Linoleum with inlaid game markers. West Milwaukee High School, Wis.

CONGOLEUM-NAIRN INC.
KEARNY, NEW JERSEY

THE HOLTZER-CABOT ELECTRIC CO.

125 Amory Street, Boston, Mass.

The Holtzer-Cabot Electric Co., Ltd., Montreal, Canada



Modern Design Master with Mercurial Pendulum

PRODUCTS

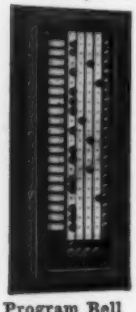
Electric Clock Systems
Program Bell Systems
School Fire Alarm Systems **(See page 73)**
School Telephone Systems **(See page 73)**
Electric Distribution Equipment for Science Laboratories **(see page 404)**

HOLTZER-CABOT ELECTRIC CLOCK SYSTEMS

The Holtzer-Cabot Electric Company, with its sixty years' specialization in the design and manufacture of signal systems, offers a complete line of Electric Clock Systems of the Minute Impulse Type, recommended for all average and large installations, and Synchronous Motor Driven Systems, recommended for smaller schools, where first cost must be kept as low as possible.

Holtzer-Cabot Standard Master Clocks are first of all accurate, and built for continued accuracy through a long life. Movements are self-wound, and embody all time-proven features. Pendulums are of three types: the conventional wood rod with metal bob; the all-metal precision compensating, for those requiring more rigid regulation; and the mercurial compensating, for finest regulation and accuracy (the last two of special design by Holtzer-Cabot engineers, and carefully calibrated). Hourly supervision for minor current interruptions up to twenty-five minutes fast or slow can be furnished, if desired, for any type system.

Round Metal Flush Secondary Clock
Dials 8", 10", 12", 14", 18 and 24"



Program Bell Connector

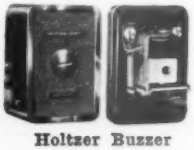
AUTOMATIC PROGRAM CONTROL

Holtzer-Cabot Automatic Program Controls are made in both the all-metal Drum Type, and the Paper Tape Type, and are sturdy in design and dependable in performance. The function of these devices is to close different circuits for short periods of time, at such intervals as may be necessary for the purpose of sounding program signals according to a pre-arranged schedule. Both the Drum and the Tape type controls are usually equipped with a secondary movement, and driven from a Master Clock. They can, however, be furnished with synchronous motor drive, to serve as a Program Control only, for installations where a secondary clock system is not used. If desired, they can be synchronous motor driven, and supplied with Master Clock contacts, to operate minute impulse secondary clocks, thereby serving as a combined Program Control and Master Clock.

Synchronous Master Program Clock

The necessary relays, switches and push buttons for operating the program bells are regularly supplied; also those required for operating secondary clocks, if to be used as a Combined Program Control and Master Clock.

Under Dome Gong



Holtzer Buzzer

School Yard Gong

Program Sounding Devices are of three types: classroom bells or buzzers, corridor and gymnasium bells, and schoolyard gongs.

Metal Drum Program Control

TELEPHONE SYSTEMS

Holtzer-Cabot School Telephone Systems are of three general types: **Switchboard Type System,** for large schools, where 50 to 200 telephones are required; **Master Phone System,** in which a master phone receives all calls (used in schools where centralized control is desired); and the **Intercommunicating System,** in which any station in the building can talk with any other station without calling a central station. We recommend that the Switchboard System be installed in central high schools, where the Superintendent of Schools, Business Manager or other educational officers may be in the same building. The Master Phone system will be found fully adequate in small schools. With this system, the principal can communicate with any classroom, but classrooms can communicate with each other only through the principal's office.

Holtzer-Cabot engineers will gladly survey your needs and suggest the applications best suited for an efficient yet economical installation. They have many types available from many years in design. There is no obligation.

Chalk and Dust Proof Telephone

Desk Type Switchboard

Cradle Phone

Hand Set for Wall or Desk Use

TYPICAL FIRE ALARM STATIONS

A fire alarm for a school should be carefully applied to each individual need of a community. To meet the needs of City school systems, **Type SA Fire Alarm System** is complete, in that it provides for sounding a fire drill signal or a signal for actual fire, both identical so far as the pupils can tell, yet with absolutely no chance of summoning the city fire department except for an actual fire.

When City firm alarm connection is not desired, there are more economical types of Systems available to meet the specific requirements of your school. The CI—AI—ETS are all approved systems to fit the needs of Schools of various sizes.

Holtzer Station Pull-door Coded

Holtzer Station Break Glass Coded

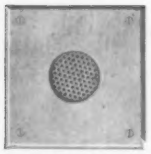
TYPICAL SOUNDING UNITS

The **Group Type System** is a system for colleges and institutions having a group of buildings. It has a master control at a central point. The system may be so arranged that an alarm may sound in one building only, or in any selected group of buildings as desired.

Automatic Fire Detection for remote hazards as supply rooms, broom closets, etc., can be applied to any of these systems by use of the Fire-Eye.

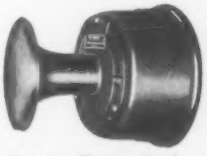
Break Glass Non-code

"Fire-Eye" Detector



Reacto Horn Flush Mounted

Holtzer-Cabot Engineers can save money and lives by assisting in the layout of the most efficient system for your needs. Pictured are several of the types of Fire Alarm Stations and sounding units available to meet the needs of any type school.



Reacto Horn Surface Type

Under Dome Single Stroke Gong

THE JENNISON-WRIGHT COMPANY

Toledo, Ohio

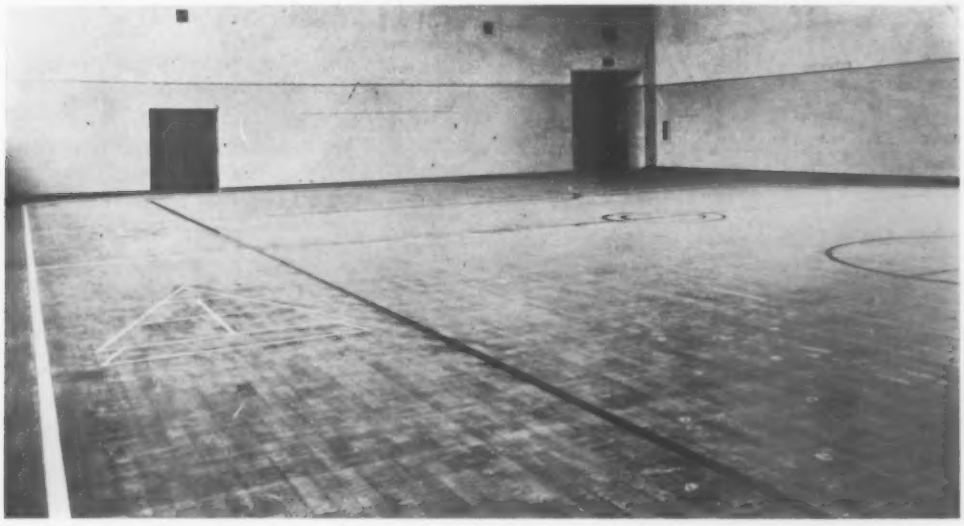
Branches in All Large Cities

Kreolite Separate Wood Block Floors serve in the school and educational institution no less than in the factory and work shop where today their use is so general as to reveal Kreolite as the national choice for heavy-duty service.

Especially is Kreolite specified for all departments where mechanical operations are carried on. Tools are not damaged when they are dropped, for the Kreolite floor is resilient. The floor is not damaged because wear and accident leave no appreciable impression upon the tough end grain surface of the specially treated selected wood blocks.

Among the scores of leading educational institutions now enjoying the economy and benefit of Kreolite Wood Block Floors are: Cleveland High School, Cleveland, Ohio; Jefferson High School, Los Angeles, Calif.; Lindbloom High School, Chicago, Ill.; University of Michigan, Ann Arbor, Mich.; Purdue University, Lafayette, Ind.; Technical School, Indianapolis, Ind.; University of Illinois, Urbana, Ill.; University of Wisconsin, Madison, Wisc.; Yale University, New Haven, Conn.

Write for complete information



STRIP END GRAIN WOOD BLOCK FLOORING

The value of Kreolite Flexible Strip End Grain Wood Block Flooring is recognized instantly by the modern architect of schools and public buildings.

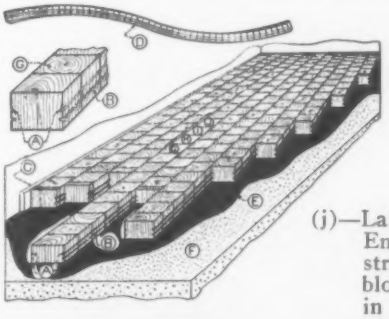
Among the big new schools in which this ultra-modern floor has been laid is the Oceanside High School, Oceanside, Long Island, N. Y. A view of the gymnasium is shown above. This floor is used for general gymnasium purposes — Hand Ball, Volley Ball, Basket Ball, Shuffle Board, and other athletic games, as well as dancing.

Architect—Frederic P. Wiedersum, 240 Rockaway Avenue, Valley Stream, Long Island, N. Y.
General Contractors—Caulway, Incorporated, 1841 Broadway, New York City.

Kreolite Flexible Strip End Grain Wood Blocks can not become loose. The durability is practically limitless as the strips are laid with the tough end grain of the individual blocks uppermost. The light natural color and beauty of the wood is retained although the blocks are treated with a transparent waterproof preservative.

Complete information sent on request

(a)—Metal wire truss binding the individual blocks into a compact, solid monolithic-like end-grain plank or strip.
(b)—Metal spline binding the individual strips together.
(c)—Cork expansion joint laid flush with the surface of the floor.
(d)—Flexibility—can be laid over wood sub-floor, in mill type buildings.
(e)—Waterproof membrane between concrete and strips.
(f)—Smooth finish concrete foundation.



(g)—Surface sanded smooth.
(h)—Manufactured from properly dried yellow pine or redwood.
(i)—Treated with a transparent, odorless, waterproofing preservative so that the natural light color of the wood is maintained. The end grain of the wood, waxed and highly polished if desired, presents a most beautiful design.
(j)—Laid with the tough end-grain up. End-grain blocks run full depth of strips, from top to bottom, each block being anchored to the base, in a bed of mastic.

KREOLITE

FLEXIBLE STRIP WOOD BLOCK FLOORING

THE AMERICAN SCHOOL AND UNIVERSITY

KNAPP BROTHERS MANUFACTURING COMPANY

Manufacturers

REPRESENTATIVES IN ALL THE PRINCIPAL CITIES

Main Office: JOLIET, ILL.
220 N. Scott St.

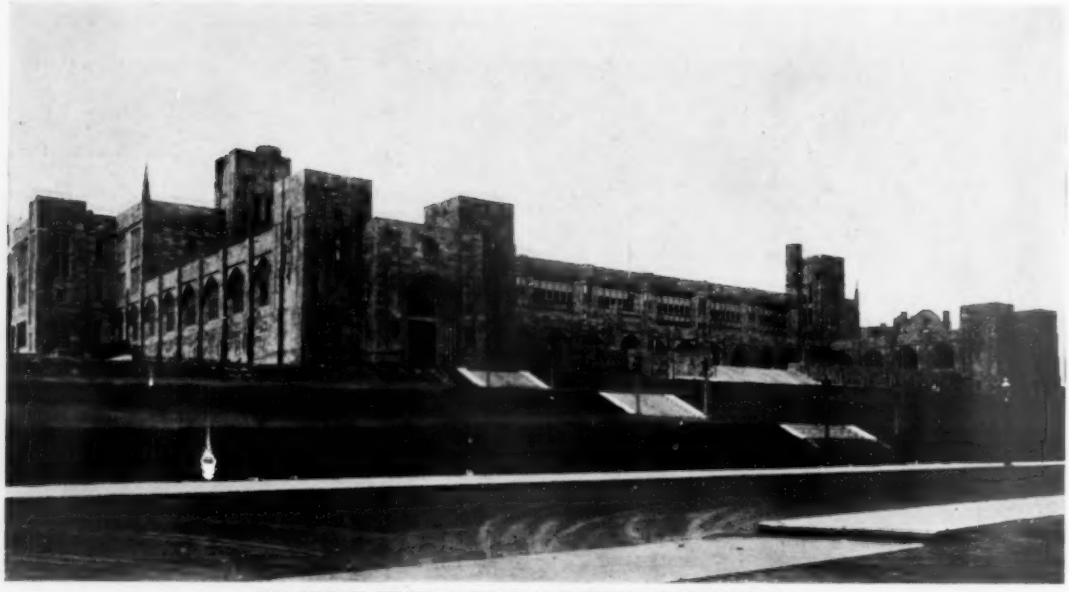
Established 1905

Manufacturers of a complete line of metal trim, corner bead, metal lath and metal Specialties.

See us in SWEETS

PRODUCTS

Metal Corner Bead, Metal Lath, Metal Lath Accessories
and
Sanitary Metal Trim and Specialties



BRIGHTON HIGH SCHOOL BUILDING, BOSTON, MASS.
O'Connell and Shaw, Architects, Boston, Mass.

Architects O'Connell and Shaw of Boston, Mass., specified Knapp Metal trim for the Brighton High School, Boston, Mass. Outstanding educational institutions throughout the country bear silent testimony to the merit of Knapp Sanitary Metal Trim.

Knapp Sanitary Metal Trim continues paying yearly dividends in the form of reduced maintenance and replacement costs; a lasting monument to the good judgment of the architects and school authorities that used them.

Knapp Brothers Manufacturing Company developed and pioneered "Plastered-In" Sanitary Metal Trim. Thirty years ago Knapp Corner Beads revolutionized the technic of plastering. Today Knapp "Plastered-In" trim is establishing new ideas in the finishing of buildings.

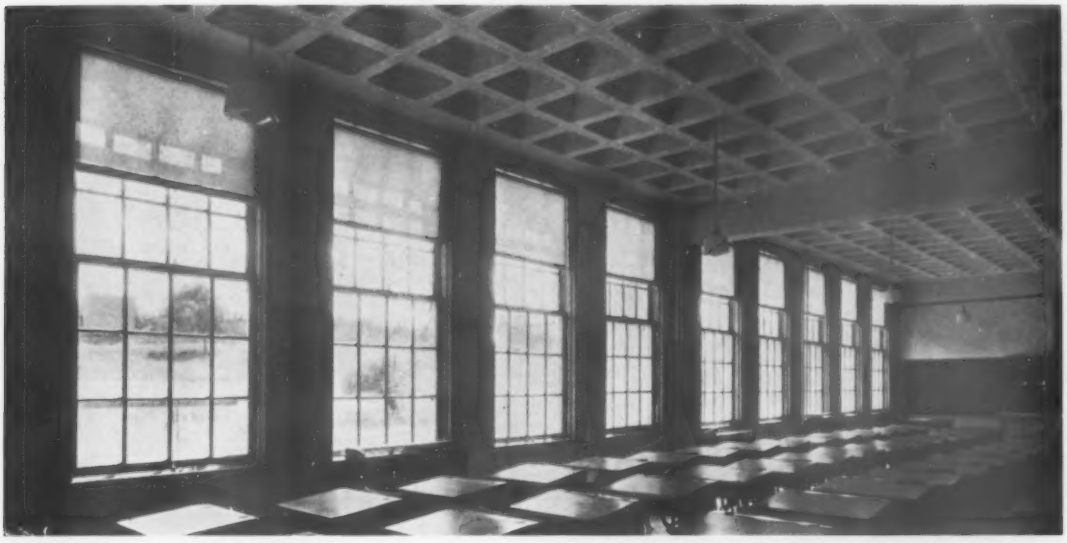
Knapp Brothers Manufacturing Company continues to lead in this field.

INSIST ON KNAPP SANITARY METAL TRIM

Knapp metal trim products are made from best quality tight coat galvanized steel sheets. They are formed on modern equipment by workmen who have been trained in KNAPP QUALITY WORKMANSHIP.

Knapp Products are designed and engineered by architects and each product has been produced to meet specific requirements.

The school room illustrated on this page is trimmed with Knapp metal trim. This trim is "built into" the structure. It is sanitary and EVERLASTING. Note particularly its neat and business-like appearance.



KNAPP BASEBOARDS

Perhaps no single item in a building takes greater "punishment" than the baseboard. It must withstand the expansion and contraction due to temperature changes, as well as movement due to settlement and deflection of structural members. The baseboard must resist constant cleaning and scrubbing and should form a tight sanitary seal to prevent the accumulation of dirt and the breeding of vermin and bacteria.

Knapp "Plastered-In" baseboards are the logical answer. They are "built-in"; do not crack, shrink or swell; they are as permanent as the building.

WINDOW TRIM AND STOOLS

Knapp metal stools are custom made to fit the special requirements of your building. They are constructed from tight coat galvanized steel and primed with Knapp special primer. They successfully withstand the abuse to which they are subjected.

Knapp Flush sanitary "Plastered-In" trim assures neat perfectly formed window openings; do not disintegrate from infiltration of moisture through the window frame.

CHALK TROUGHS AND TRIM

Knapp chalk troughs with dust screens or pans are scientifically designed. Metal mouldings are available in several designs to hold the blackboard and neatly trim the panels.

Write for details of Knapp "Plastered-In" Blackboard trim construction; **a new development.** Refer to Knapp No. 313, also Knapp **new** dust pan No. 314 and Knapp Map Rail No. 19.

CASINGS

"Plastered-In" casings conform to the latest trends in design; they are flush, economical and entirely sanitary. Write for our latest casing sections and details of construction.

CORNER BEADS, ETC.

Knapp solid wing corner beads are straight, rigid and scientifically designed to provide **straight** corners. There is a Knapp Bead for every purpose.

The name Knapp on Metal Lath and other plasterers' accessories assures quality merchandise.

THE LOXIT CO.

605 West Washington Blvd., Chicago, Illinois

AGENTS IN PRINCIPAL CITIES

THE LOXIT FLOOR SYSTEM

NO CRACKS

NO BUCKLING

NO SQUEAKS

NO CREEPING

NO SPLIT BOARDS

NO NAILS

NO MASTIC

NO WOOD SLEEPERS

NO INSERTS

NO FILL

A Mechanical System That Assures Stability and Beauty

Simple and Practical

Any carpenter can lay LOXIT floors easily, rapidly and satisfactorily without previous experience. By driving up the board, he drives up the LOXIT clips, locking the boards together and to the LOXIT channel, forming the positive LOXIT interlock.

Economical

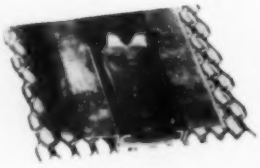
It costs no more to lay floors the LOXIT way—often less—than other types of flooring. LOXIT eliminates wood sleepers, inserts and fill. It saves story height. Total thickness, including $\frac{13}{16}$" flooring, is only $1\frac{1}{8}$".

Used with Stock Flooring

The LOXIT System can be used with all standard milled tongue-and-groove flooring. Special milling is NOT required.

LOXIT Gymnasium Floors

This is a compound LOXIT floor construction that assures resiliency and complete end-match protection. Recommended for factory and warehouse floors.



New LOXIT Floor Channel is set with cement or LOXIT grout. Drilling of concrete slab, anchors, and shimming eliminated. Leveling greatly simplified

A Few Typical Installations

Schools:

Deerfield High School, Lake Forest, Ill.
Junior College, Long Beach, Calif.
Ellwood City School, Ellwood City, Pa.
Toledo University, Toledo, Ohio
Central High School, South Bend, Ind.
McPherson Grade School, McPherson, Kan.
Orofino High School, Orofino, Idaho
Galeville School, Saline, N. Y.
Seneca Falls School, Seneca Falls, N. Y.
Lourdes High School, Chicago, Ill.
City High School, Calumet City, Ill.
Gary High School, Gary, Ind.

Other Buildings:

WGN Broadcasting Studios, Chicago, Ill.
Montgomery Ward Store, Sioux City, Iowa
York County Jail, York County, S. C.
Weaver Witwer Residence, Cedar Rapids
Model House, Wheeling, W. Va.
Forest Products Laboratories, Madison, Wis.
Jewish Community Center, Albany, N. Y.
State Laboratories, Springfield, Ill. (2)
Durant-Radford & Co., Algoa, South Africa
Joseph Leitner Residence, Yonkers, N. Y.

LOXIT Literature

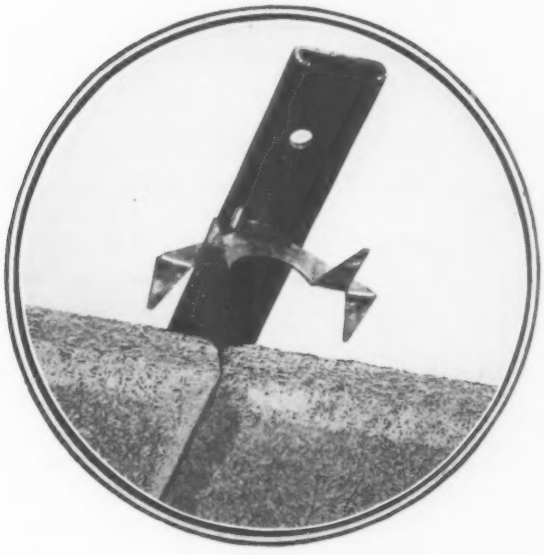
LOXIT bulletins, instruction sheets, details, handbooks, and special folders on LOXIT gymnasium or heavy-duty floors will be sent on request.

THE LOXIT ACOUSTICAL TILE SYSTEM

SIMPLE

ECONOMICAL

PRACTICAL



NO NAILS

NO MASTIC

NO INSERTS

A Mechanical System to Be Used with All Fibrous Acoustical Tiles and Slabs

Simple and Practical

The LOXIT System is completely mechanical, eliminating the use of nails or mastic. It can be used with ALL square or beveled edge, fibrous acoustical tiles or slabs. No kerfs or rabbets are required. All metal parts are completely concealed. In case of changes, a LOXIT-laid acoustic tile wall or ceiling salvages 100%.

Slabs

The LOXIT System is adaptable to the laying of acoustical slab materials as well as acoustical tile. Can be used for walls and ceilings. Clips are available for materials ½" thick or more.

Flexible

The LOXIT System is designed to lay acoustical tile with either matched or staggered joints. Special clips with adjustable extension arms are available for suspended ceilings of any depth, without the use of furring. This construction permits the sealing of all joints, eliminating breathing.

Acoustical Tile Clip to Lay Tile with Staggered or Broken Joint

Acoustical Tile Clip for Suspended Acoustical Tile Ceilings Without Furring —Extension in Place Ready to Be Clamped to the Shank of the Clip

Cost

The LOXIT System is unique. It is the most economical and most flexible method of laying acoustical tile or slabs on the market. By properly lining up and leveling the channel, a smooth, clean, even acoustical job is automatically secured.

Typical Installations

Liquid Carbonic Building, Chicago
Wieland Dairy Company, Chicago
Union League Club, Chicago
Marshall Field Beauty Salon, Chicago
Our Lady of Peace Church, Chicago
Chicago Daily Times Offices, Chicago
University of Arkansas, Fayetteville
De Paul University, Chicago
City High School, Calumet City
H. Chanon Company, The, Chicago

LOXIT Literature

LOXIT bulletins, details, instruction sheets and handbooks are available upon request.

MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

GENERAL OFFICES AND MAIN PLANT

Minneapolis, Minnesota

Research Division and Plant: Wabash, Ind.

THE BROWN INSTRUMENT CO.

Division of Minneapolis-Honeywell Reg. Co.

Main Office and Plant — Philadelphia, Penn.

BRANCH OFFICES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES AND FOREIGN COUNTRIES

THE MODUTROL SYSTEM OF AUTOMATIC CONTROL

FOR HEATING, VENTILATING AND AIR CONDITIONING

Room Type Thermostat

The Modutrol System designation is applied to any combination of Minneapolis-Honeywell Automatic Electric Controls or Self-contained Automatic Valves used to govern the operation of air conditioning or heating systems other than the small domestic installations. In this System the well-known dependability of electric switches and motors, the permanency of electric wiring, the flexibility of self-contained units and the accessibility of each and every portion of the equipment represent just a few of many advantages offered in this modern means of air conditioning control.

EFFECTS TRUE MODULATION

The Modustat Self-Contained Radiator Valve

Viewed from the performance standpoint, the Modutrol System offers the only available means of effecting true modulation of the temperature, air flow and humidity. True modulation means automatic proportioning of heat, cold, air flow or humidity in exactly the required amount to offset changes in the heat loss or relative humidity. Modulation of dampers and steam flow valves is accomplished through the use of the electric proportioning or Modutrol Motors, a development pioneered by Minneapolis-Honeywell.

In the case of direct radiation, the Modustat accomplishes the same true modulation of the steam flow to each radiator.

PROVIDES EXTREME FLEXIBILITY

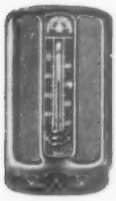
Supplementing the modulating controls is a wide variety of on-and-off or two-position motors, controllers and valves, thus making the Modutrol System extremely flexible as to the selection of control equipment to produce the desired results.

APPLICABLE TO ALL TYPES OF SCHOOL BUILDINGS

Electric Motor Radiator Valve

Therefore this System of Control may be applied to any form of air conditioning or heating system, in new buildings or old.

The very satisfactory results obtained from installations in many school buildings throughout the entire country during the past several years is a definite indication of the accuracy, flexibility, and reliability of this electrical system of automatic control. Certainly no other general type of installation requires more exacting results under wide variations in load conditions.



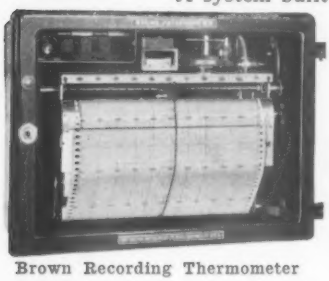
Twin Type Room Thermostat

AUTOMATIC CONTROLS REDUCE COST OF OPERATION OF HEATING, VENTILATING AND AIR CONDITIONING

In new buildings or old, a lowering of operating costs, and an immense improvement in the comfort delivered, can be accomplished by considering the control system as an integral part of the heating system. In fact, automatic control systems today cannot be considered as accessory to the heating systems.

A system built for automatic operation with oil, gas, stoker or central station steam must take into account all of the problems that those methods of operation introduce. In addition, it must deal with the problems and distinctive characteristics of hot water, steam, vapor, warm air heating systems when automatically fired.

The Minneapolis-Honeywell Modutrol System has been prepared to meet the requirements of each type of heating system as well as fuel, and is designed to produce equally satisfactory results with all combinations.



Brown Recording Thermometer

PERFORMANCE RECORDS ARE IMPORTANT

In order to get best results at minimum operating costs, indicating and recording thermometers should be used to check the system periodically. Furthermore, the boiler room should be equipped with thermostats, gauges, CO_2 meters, and, in some instances, flow meters. M-H is prepared to supply complete recording and indicating equipment for the boiler room and air conditioning installation.

Humidity Control

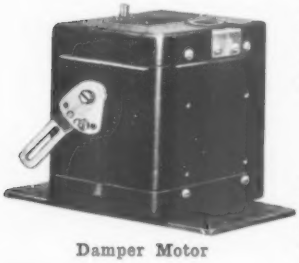
ENGINEERING SERVICE AVAILABLE

The experience of one hundred twenty-five years of concentration upon temperature control problems has built up within the Minneapolis-Honeywell organization the knowledge, technique and engineering ability which have produced the Modutrol System and Brown Instruments as well as the comparatively simple domestic control systems.

The M-H engineer is at your service at all times. He will be glad to furnish you with recommended control layouts and cost estimates.

He is trained to recommend control results before the installation of equipment and to produce control results after installation is made.

COMPLETE INSTALLATION SERVICE



Damper Motor

Branch Offices and Distributors are equipped to make the complete installation of the Modutrol System for control of Air Conditioning or Heating installations. Thoroughly trained men are also available to supervise, adjust, or service the control equipment if the purchaser prefers to make his own installation of controls.

RESPONSIBILITY FOR ENTIRE CONTROL SYSTEM

The Modutrol System and its supplementary equipment is so complete that the Company is equipped to assume the entire responsibility for any control installation, thereby eliminating the difficulties and misunderstandings which always arise when the responsibility is split between two or more manufacturers.

Motorized Coil Valve

TYPICAL INSTALLATIONS IN SCHOOLS

The following list of typical installations of the Modutrol System in school buildings illustrates the wide acceptance of this modern system of automatic control:

Theodore Roosevelt High School, West Orange, N. J.
Roeliff Jansen School, Hillsdale, N. Y.
McKinley School, Montrose, N. Y.
Rockefeller Hall, Cornell University, Ithaca, N. Y.
Saint Mary's School, Port Chester, N. Y.
Central School Building, Pine Plains, N. Y.
Rodger Ludlow School, Fairfield, Conn.
Harkness Memorial Building, Yale University, New Haven, Conn.
Warren Township School, Warren Twp., N. J.
Norwich Free Academy, Norwich, Conn.
Harris School, Needham, Mass.
Villanova Gymnasium, Villanova College, Villanova, Penn.
Mt. Pleasant Junior High School, Bellevue, Del.
Residence Park School, Dayton, Ohio
Gibbens, Caldwell, and McMahon Halls, Catholic Univ., Washington, D. C.
Mary E. Miller Vocational School, Minneapolis, Minn.
Eagle Lake School, Cromwell, Minn.
Sheridan School, Minneapolis, Minn.
North Aurora Grade School, Chicago, Ill.
Nathan Hale Grade School, West Allis, Wis.
Astronomical Library, Harvard Univ., Cambridge, Mass.
Wellsboro High School, Wellsboro, Penn.

THE NATIONAL TERRAZZO and MOSAIC ASSOCIATION

Secretary's Office: 524 Brook Street, Louisville, Ky.

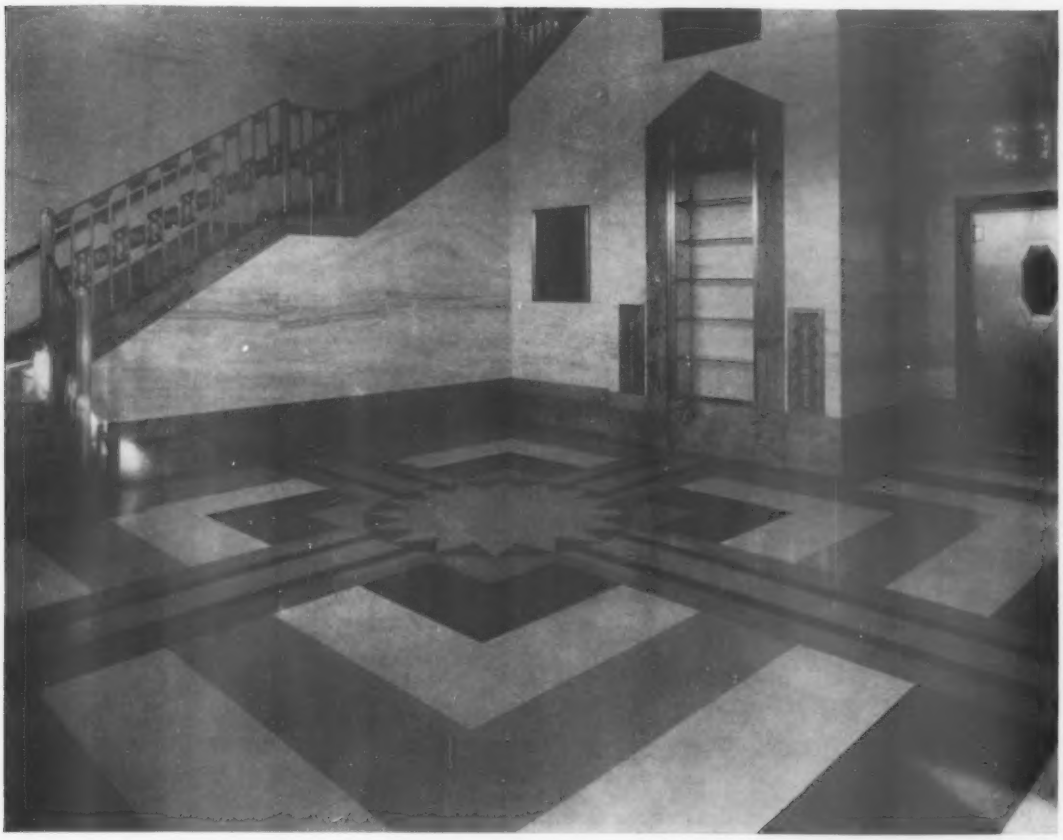
In addition to its permanent durability and good appearance, terrazzo's flexibility in design (well illu- rated in this floor with its map design) makes it particularly appropriate for school use.

● Made with marble chips, portland cement and water, plus mineral color pigment where desired, and separated by dividing strips to guard against cracking, terrazzo floors have these advantages: (1) colorful beauty, (2) flexible, individual designs, (3) the permanence and durability of concrete, (4) economy and ease of installation and maintenance.

For floors in the entrances, corridors, classrooms, offices and laboratories of school buildings, where severe wear makes durability the major flooring requisite, terrazzo provides a dense, hard wear-proof surface. And because the range of color in marble chips and pigment combinations is practically unlimited, terrazzo is as colorfully beautiful as it is durable.

In design there are likewise no limitations. Simple, repetitive patterns or detailed pictorial designs are carried out in terrazzo floors precisely as planned. Each terrazzo floor may have an *individual* motif, or the terrazzo floors throughout the school building may follow one central design.

School floors must be durable, but they need not be drab. School floors can be bright and colorful and cheerful and at the same time give long, economical service—built with terrazzo. Detailed information and complete specifications will be sent promptly upon request.



This terrazzo floor in the Samuel Gompers High School for Boys, in New York City, carries heavy traffic with minimum wear and low maintenance cost. Artistry and durability combined in this beautiful floor.

Stairs of terrazzo are as practical as durable and as excellent in appearance as terrazzo floors. Treads are made non-slip with an abrasive aggregate.

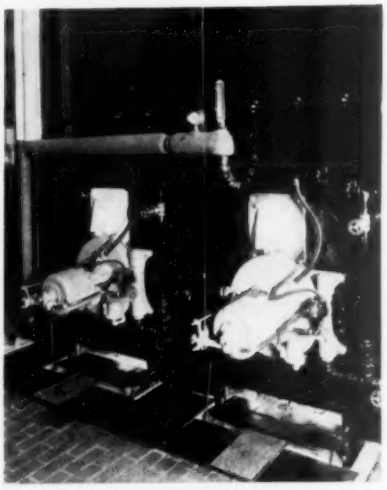
Corridor floors of terrazzo, like this one, take the hardest kind of wear and come up smiling. Easy to clean, hard to mar, terrazzo combines beauty with durability.

PETROLEUM HEAT AND POWER CO.

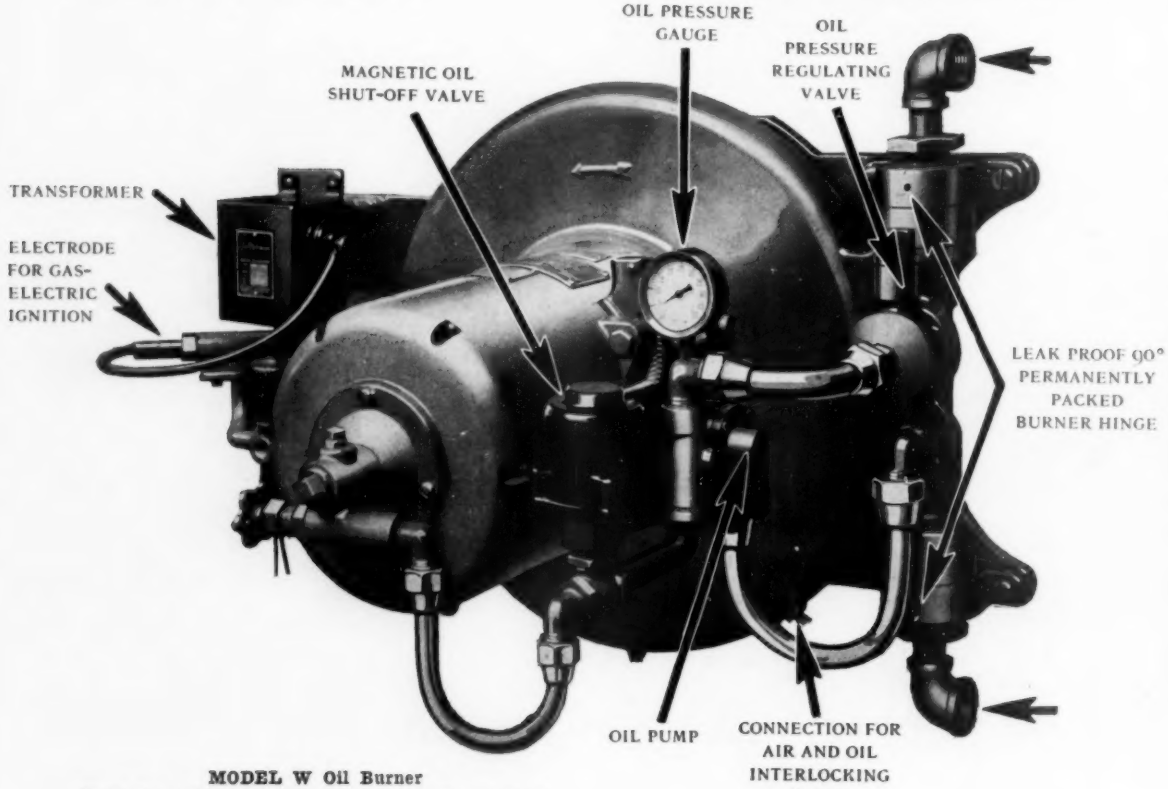
Stamford, Conn.

PETRO-NOKOL OIL BURNERS FOR SCHOOLS — LARGE AND SMALL

Are you considering the installation of a new heating system in any school or college building? If so, no doubt you have already given the matter some study and been impressed with the immense superiority of oil-burning equipment over coal-burning furnaces:—the increased operating efficiency of the oil burner, due to more perfect combustion; the increased fuel economy, with no ash loss; the increased capacity of the boiler—almost double, when oil is used instead of coal; the increased responsiveness of the oil-fired boiler (producing steam at the required pressure, in the required amounts, in double-quick time); the increased life of the boiler and brick work; the saving in space required for fuel storage; the elimination of coal handling and ash removal; the tremendous saving of janitors' time; the greater convenience in fuel delivery; and the elimination of the smoke nuisance.



Showing an Installation of the MODEL W Oil Burner


OIL PRESSURE GAUGE
OIL PRESSURE REGULATING VALVE
MAGNETIC OIL SHUT-OFF VALVE
TRANSFORMER
ELECTRODE FOR GAS-ELECTRIC IGNITION
LEAK PROOF 90° PERMANENTLY PACKED BURNER HINGE
OIL PUMP
CONNECTION FOR AIR AND OIL INTERLOCKING VALVE

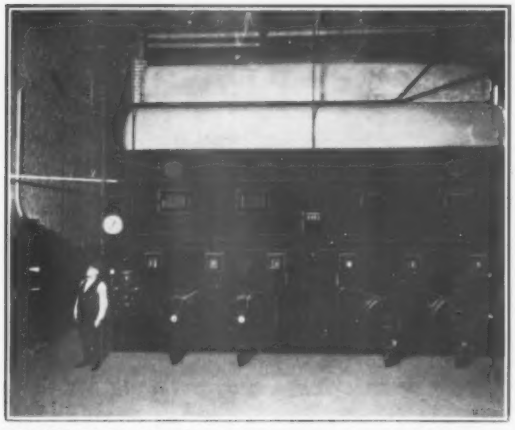
MODEL W Oil Burner
Built for school heating systems—small and large

THE AMERICAN SCHOOL AND UNIVERSITY

Having decided on oil-burning rather than coal-burning equipment, the next step is to choose the proper make and type of oil burner. Be sure to investigate the Petro-Nokol Oil Burner Systems, manufactured by the Petroleum Heat and

WORLD'S LARGEST OIL HEATING ORGANIZATION

Power Company, the world's largest oil heating organization. The experience of this company in making all types of good oil burners and in selling low-priced fuel oil to operate in these burners has resulted in placing oil heat on a new economic basis.



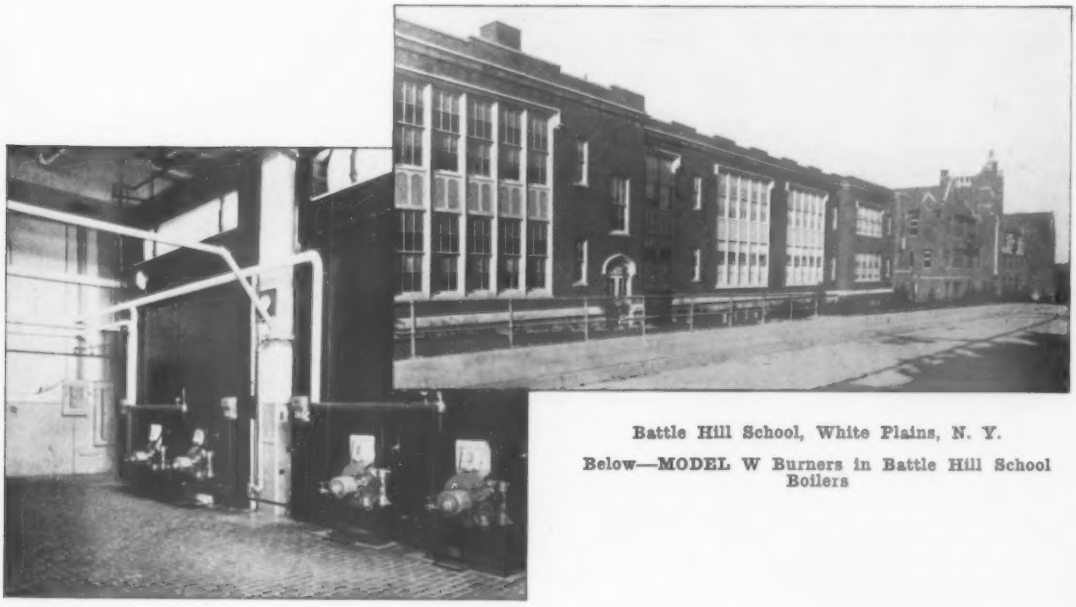
MODEL H Turbine Type Oil Burner Installed in Toledo University, Toledo, Ohio

We suggest that you consult a Petroleum Heat and Power Company representative and accept his recommendation as to the type of burner best suited to meet your special heating requirements. He can be depended upon to give your heating problem an impartial, unbiased analysis.

THREE TYPES OF OIL BURNERS

There are three main types of Petro-Nokol Burners suited to school use: the Petro MODEL W for small or medium-sized buildings—which represents the perfection of engineering design in the horizontal rotary burner, and is known from coast to coast for its remarkable performance qualities, its quiet, trouble-free operation, and its long life; the Petro MODEL M Mechanical Type Burner, which has given utmost satisfaction and economical performance in many buildings throughout the country; and the MODEL H Turbine Burner, the "last word" in air-impelled rotary cup design, which now heats so many of this country's large buildings and is particularly well adapted to multiple boiler installations.

We shall be glad to send illustrated literature on these oil burners to any interested school executive. Our primary interest is the creation of satisfied users of oil heat. We supply both the fuel and the burner. Let us tell you about our 100% guaranteed oil heating service.



Battle Hill School, White Plains, N. Y.

Below—MODEL W Burners in Battle Hill School Boilers

THE POWERS REGULATOR COMPANY

40 Years of Specialization in Temperature Control

Chicago
2724 Greenview Avenue

OFFICES IN 43 CITIES
See your phone directory

New York City
231 E. 46th Street

AUTOMATIC TEMPERATURE AND HUMIDITY CONTROL

For Heating, Ventilating, and Air Conditioning Systems

At Harvard, Yale, Princeton, Vassar, Wellesley and hundreds of other prominent educational institutions will be found buildings equipped with the Powers Pneumatic System of Automatic Temperature and Humidity Control.

Over 40 years of experience in developing and installing automatic control for heating, ventilating and air conditioning equipment in all types of old and new buildings qualify us to assist school executives, architects, and engineers on any problem of temperature and humidity regulation.

Powers pneumatic systems often cost more than other types but they are worth more because: they often given 15 to 20 years of accurate and dependable control; practically no repair expense.

Powers thermostats do not get out of adjustment permitting UNDER-heating and OVER-heating which not only wastes fuel but causes discomfort. Neither the extreme heat of Summer, sub-zero temperatures of Winter, nor the vibrations in some buildings, change their adjustment. They need no annual overhauling or adjustment, and the true graduated action of their powerful vapor disc controls valves or dampers gradually—resulting in exceedingly accurate regulation.

Write for Estimate. Let one of our engineers study your requirements and submit an estimate of the cost of installing the type of control best suited to your needs.

Self-operated Controls. We also manufacture a very complete line of self-operating temperature regulators that do not require electricity or compressed air for their operation. **Write for bulletins,** if interested.

Some of the many Schools, Colleges, and Universities using Powers Automatic Temperature Control:

California Institute of Technology
University of Chicago
Creighton University
Dartmouth College
Georgetown University
Harvard University
University of Illinois
Lehigh University
Louisiana State University
Massachusetts Institute of Technology
University of Michigan
University of Missouri
Purdue University
Smith College
Vassar College
University of Washington
Wellesley College
Yale University

Los Angeles, Cal.	20 Schools	Kansas City, Mo.	40 Schools
Washington, D. C.	21 Schools	St. Joseph, Mo.	12 Schools
Chicago, Ill.	21 Schools	St. Louis, Mo.	10 Schools
Indianapolis, Ind.	24 Schools	Montclair, N. J.	14 Schools
Sioux City, Iowa	11 Schools	Newark, N. J.	12 Schools
Wichita, Kan.	12 Schools	New York City, N. Y.	17 Schools
Boston, Mass.	11 Schools	Yonkers, N. Y.	19 Schools
Brookline, Mass.	11 Schools	Cincinnati, Ohio	13 Schools
Fall River, Mass.	11 Schools	Cleveland, Ohio	21 Schools
New Bedford, Mass.	14 Scholos	Oklahoma City, Okla.	19 Schools
Worcester, Mass.	19 Schools	Philadelphia, Pa.	23 Schools
Detroit, Mich.	24 Schools	Seattle, Wash.	14 Schools

SAFETY WATER MIXING VALVES

Safety Shower Mixers

A complete line of both pressure equalizing valve and thermostatic shower mixers that absolutely protect bathers from scalding temperatures caused by pressure and temperature fluctuations in pipe lines, and prevent sudden "shots" of hot or cold water. Maximum temperature of delivery can be limited.

Thermostatic Water Controller

For group or gang showers, zone or progressive showers, laundry wash wheels, etc. Will mix hot and cold in quantities up to 100 gallons per minute and deliver at any temperature desired. Is positively scald proof.

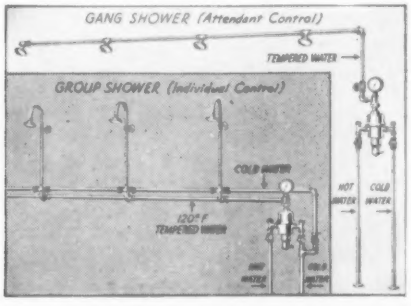
Group or Gang Shower Control—Powers Thermostatic Water Controllers are used for the control of shower baths in groups varying in size from 4 to 20 stalls. They may be used to establish a maximum temperature of hot water supply to protect the entire group from danger of scalding, or to place the entire group of showers under the control of an attendant.

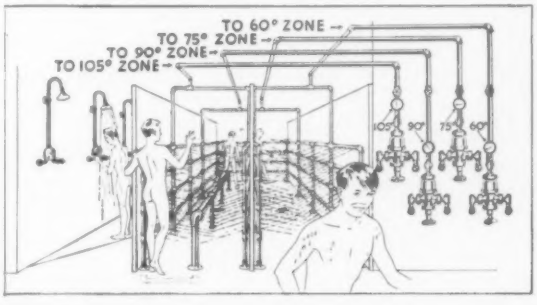
Individual Shower Control is best suited for adults as it permits each bather to individually adjust the temperature of his shower while the hot water is kept at a safe maximum temperature.

Attendant Control is best suited for the bathing of children in schools, institutions, etc., as the temperature of the entire group of showers is adjusted by one individual.

Zone or Progressive Showers—Where compulsory bathing is required before entering swimming pools, lane showers are divided into four zones, each controlled by a Powers Controller. First zone is maintained at 105° F.; second at 90° F.; third at 75° F.; and fourth at 60° F. Because of its efficiency and its hygienic and sanitary advantage, this type of shower is rapidly increasing in popularity.

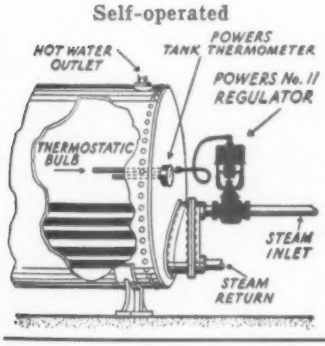
Write today for new 24-page Bulletin No. 258 which shows photographs of the most modern shower installation, gives helpful advice in laying out shower rooms and completely describes Power Safety Water Mixing Valves.





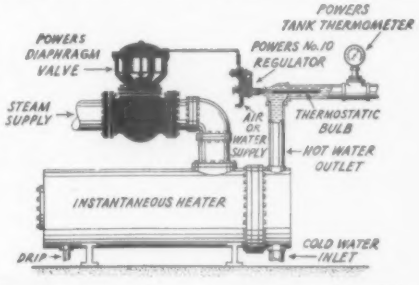
TEMPERATURE CONTROL FOR STEAM HEATED HOT WATER HEATERS

Self-operated



The most complete line of money saving regulators for this purpose. Often pay for themselves during the first year. All steam valve sizes up to 10 inch. **Write for Bulletin No. 2035.**

Compressed Air or Water Pressure Operated



SCOVILL MANUFACTURING CO.

Plumbers' Brass Goods Division

WATERVILLE, CONNECTICUT

Scovill Flush Valves; Shower, Bath, and Lavatory Fittings; Tubular and Miscellaneous Plumbers' Brass Goods

SCOVILL FLUSH VALVE PROVED IN SERVICE

Years of hard, continuous usage under severe service conditions have been the proving ground for these Scovill Flush Valves. Schools, public buildings, even New York skyscrapers have found them amazingly long-lived and economical to maintain.

Lubrication is automatic in the Scovill Flush Valve. And — chief feature — it "cleans itself." With each flush, it automatically clears its by-pass of foreign matter and natural minerals from the water. Clogging is eliminated.

Operation is efficient—even under low pressures. There is no water hammer. Adjustment is from the outside—and may be handled without shutting off the water.

For economy of cost and upkeep, for ease of operation, for appearance, and for sturdy, simple construction, the Scovill Flush Valve defies criticism. Let us send you more details — in the free Flush Valve catalog.

SCOVILL

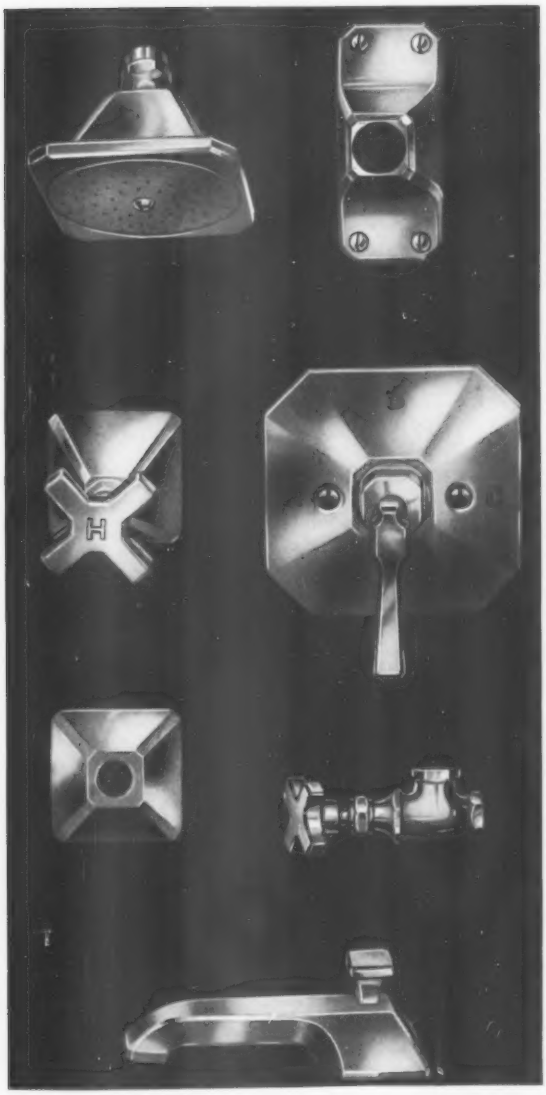
SCOVILL MANUFACTURING CO.

Plumbers' Brass Goods Division

WATERVILLE, CONNECTICUT

Scovill Flush Valves; Shower, Bath, and Lavatory Fittings; Tubular and Miscellaneous Plumbers' Brass Goods

THEIR SERVICE BEGINS BELOW THE SURFACE



The service of shower, bath, and lavatory fittings depends upon design and construction. Under the handsome modern surfaces of these Scovill fittings lie the construction that has made Scovill famous.

They're built to last — under the most severe working conditions. Valves are quick-action and leakproof. They may be adjusted easily.

Scovill fittings are priced at the lowest figure consistent with famous Scovill high quality. Let us send you a free catalog with complete information. Write Scovill Manufacturing Company, Plumbers' Brass Goods Division, Waterville, Connecticut.

SLOANE-BLABON CORPORATION

577 Fifth Avenue, New York City

W. & J. SLOANE SELLING AGENTS, INC.

BRANCHES, DISTRIBUTORS AND CONTRACTORS IN ALL PRINCIPAL CITIES

Sloane-Blabon Corporation manufactures all types of linoleum suitable for school use — Battleship, Plain, Jaspé and Inlaid. Also Cork Carpet, recommended for libraries and other rooms where an atmosphere of absolute quiet is desired.

Sloane-Blabon Linoleum is made of the highest quality raw materials. It is rigidly tested and inspected throughout all the processes of manufacture; is uniform in gauge and weight; is of the highest standard in wearing quality and finish; and exceeds the stringent requirements of the U. S. Government. Every yard which has been passed as perfect is guaranteed to give satisfactory service. The entire line is styled by W. & J. Sloane, the famous Fifth Avenue decorators, an assurance of style authenticity.

Sloane-Blabon Linoleum

A Few Representative Installations

More convincing than anything we can say about our product is the fact that it has been specified by leading architects for use in many of the country's finest schools, hospitals, hotels, and other public buildings. You will find it, for example, in such universities as Yale, Chicago, Northwestern and California, and in scores of well-known private and public schools; in the Nebraska State Capitol, generally considered as the outstanding architectural achievement in the United States during the present century; in the Waldorf-Astoria, America's finest hotel; in such famous hospitals as the Presbyterian in New York City and the Los Angeles County on the West Coast; in many of the offices of Rockefeller Center; and in the newest cruisers of the U. S. Navy.

Advantages

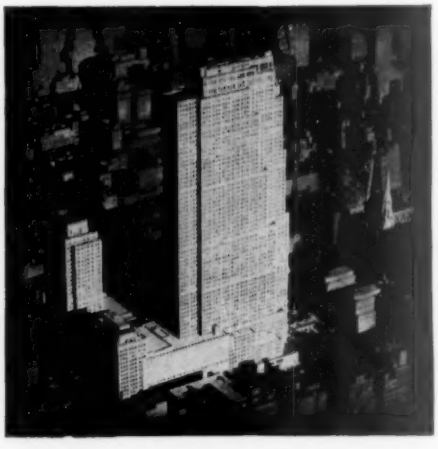
All Sloane-Blabon Linoleum carries a wear-resisting wax finish which produces a transparent lustre, fills the pores of the linoleum and prevents dirt from being ground in. Maintenance of a waxed linoleum floor is very simple; frequent brushings and, at intervals of two or three months, an occasional rewaxing being the only requirements. Experience demonstrates this form of maintenance to be at least 30% more economical than any other method.

Sloane-Blabon Linoleum is easy to install. It is genuinely resilient and quiet. It is exceedingly colorful and, therefore, well adapted to any scheme of interior decoration. While slightly higher in its initial cost than certain less dependable floor-coverings, it possesses such superior wearing qualities, that figured over a period of years, the service cost is really less than for cheaper materials. When installed according to approved methods, linoleum becomes an integral part of the floor and repairs are practically unnecessary.

Guarantee

No matter what make of linoleum you decide upon we cannot stress too strongly the selection of a competent contractor to make the installation. The competency of the contractor is second in importance only to the quality of the linoleum.

Yale University



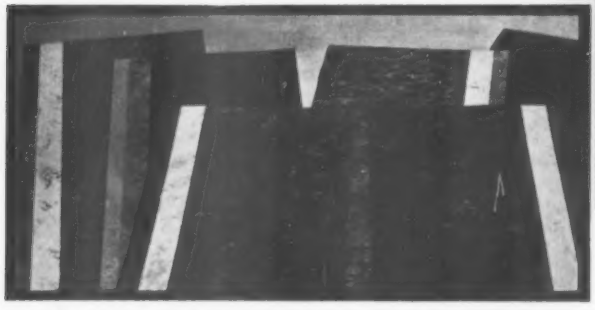
Rockefeller Center

When Sloane-Blabon Linoleum is installed by authorized Sloane-Blabon contractors we guarantee a satisfactory installation!

Wide Choice of Qualities, Patterns and Colors

Sloane-Blabon Linoleum is available in an unusually wide selection of qualities, patterns and colors, many of them exclusive with us and many of them especially designed for school use. In addition to stock patterns and colors we are equipped to produce insets and borders designed to your order. Our newest plain colors, lavishly praised by architects, decorators and magazine editors, give unusual distinction to custom installations.

A typical designed-to-order installation in the new Sloane-Blabon pastel shades



Custom-type borders by the roll (above) are made exclusively by Sloane-Blabon. These borders give the same effect as though they were designed to order, yet cost, of course, much less

School Service Department

It has been the privilege of W. & J. Sloane Selling Agents, Inc., as selling agents for floor-covering manufacturers, to cooperate with architects and contractors for more than three-fourths of a century. Our School Service Department, through long experience, is thoroughly familiar with your flooring problems. We can help you not only in the selection of the most economical types of linoleum for different parts of a building, but in the selection of patterns best suited for large or small areas; and in the selection of colors for use under varying light conditions, etc. We will recommend qualified contractors, work with your architect on technical problems and furnish you with samples and color reproductions of everything we make. There is no obligation whatsoever for this service. Please feel free to write us at length.

W. & J. Sloane Selling Agents, Inc.,
577 Fifth Ave., New York.

Waldorf-Astoria Hotel

Nebraska State Capitol

SPEAKMAN COMPANY

Wilmington, Delaware, U. S. A.

SHOWERS AND SHOWER HEADS

K-3100.

K-3100—SPEAKMAN Built-In Mixometer Shower with Anystream Self-Cleaning Head with lock-shield control.

K-3105—Same as K-3100 but with Hi-Seat Valves with unions.

K-3315—SPEAKMAN Columbia Shower.

K-3310—Same as K-3315 but with Mixometer with cast wall lugs and metal lever handle.

See our Institutional Catalog K-1 for full specifications on this shower.

K-3315.

K-3395—SPEAKMAN Anystream Self-Cleaning Shower Head with lever handle control. ½-inch size. Ball joint not furnished unless specified.

Speakman Company makes a complete line of showers, shower heads and plumbing fixtures designed for use in schools, colleges, universities and institutions. In designing this equipment particular attention has been given to water economy, as well as cost upkeep. Speakman Showers and Fixtures are sturdy in construction and easy to operate, and all parts subject to wear are renewable.

The Anystream Self-Cleaning and Adjusta-Spray Shower Heads eliminate the annoyance caused by stopped-up shower heads. Both have self-cleaning features with variable spray adjustment. Instead of holes in the face of the Anystream Self-Cleaning Head, plungers with tapered grooves give full, round, unbroken sprays. By turning the handle the bather may select a normal, needle, or flood shower spray. The flood spray flushes out any dirt or sediment.

On installations where funds available will not permit the use of the Anystream Self-Cleaning Head, we recommend the Adjusta-Spray Head. Grooved slots in the face discharge water at three different angles, insuring a well distributed spray—not a hollow-centered, cone-shaped spray. Other types of Adjusta-Spray and Anystream Self-Cleaning Heads are fully described and illustrated in our new Institutional Catalog K-1.

K-3396—SPEAKMAN Anystream Self-Cleaning Shower Head with ½-inch I. P. female inlet and lock-shield arranged to operate by a key.

K-3399—SPEAKMAN Wall Type Anystream Self-Cleaning Shower Head. This type is known as a vandal-proof head, and is widely used in schools, institutions and hospitals. It fits flat against the wall and is held by expansion or through bolts.

K-7047—SPEAKMAN Adjusta-Spray Shower Head with integral ball joint having ½-inch I. P. inlet.

SPEAKMAN SI-FLO FLUSH VALVE

K-1001-SP — SPEAKMAN Chromium Plated Si-Flo Closet Flush Valve with Si-Flo Back Syphon Preventer. Has 1-inch capped angle stop for right or left inlet, wall flange, metal oscillating handle, flush connection, spud coupling nut and flange for 1½-inch top supply.

Note: Si-Flo Flush Valves can be ordered less Back Syphon Preventer.

Patented

The Si-Flo Flush Valve eliminates all noises heretofore associated with flush valves, because these noises are prevented from forming. The Si-Flo Flush Valve is quiet in operation, is efficient, and works equally as well under high or low water pressure. This flush valve roughs in on standard measurements and can be used for new installations or to replace noisy flush valves. It can be furnished with right, left or back supply; built in the wall or seat-action type. The Si-Flo Flush Valve can also be supplied for urinals and metering showers.

For complete description, illustrations, blueprint drawings and other data, see our new Institutional Catalog K-1.

Piston Unit.

Long-wearing compact piston unit of SPEAKMAN Si-Flo Flush Valve. The only moving part of this flush valve. If replacement is ever necessary, the operation is a simple and inexpensive one.

K-1100—SPEAKMAN Si-Flo Seat Operated Closet Flush Valve with 1-inch straight stop, flush connection for 1½-inch top supply, adjustable bar check-hinge and black hard rubber open-front seat, less cover. The standard measurement from top of bowl to center of flush valve inlet is 5½ inches.

K-1100.

SINK, BATH AND LAVATORY FIXTURES

SPEAKMAN sink, bath and lavatory fixtures are designed to give the maximum of service. Every fixture is accurately machined and thoroughly tested under high water pressure. All valve parts subject to wear, including seats, are renewable. A swivel disc encasing the washer distributes wear on washer and seat. Monel metal washer-retaining screws are used because of their resistance to the corrosive action of certain types of water.

K-7120-M WILDEL Pop-up Lavatory Waste. Metal knob and metal escutcheon. 1¼-inch diameter tail.

K-6790—SPEAKMAN Self-Closing Basin Faucet. Non-removable metal indexed push button. Non-hammering. Closes by both water and spring pressure. Nozzle 3¾ inches long with non-swirl stream regulator. Renewable working parts. ¼-inch threaded tail.

Send for our new Institutional Catalog K-1. It contains full information, including blueprint drawings and technical data on various types of SPEAKMAN Showers and Fixtures especially adapted for use in schools, colleges, universities and institutions.

SPEAKMAN COMPANY,
Wilmington, Delaware.

STREAMLINE PIPE AND FITTINGS CO.

DIVISION OF MUELLER BRASS CO.

Port Huron, Michigan

PROTECT THE INVESTMENT FOR THE LIFE OF THE BUILDING WITH ENDURING COPPER AND BRONZE

STREAMLINE bronze fittings and copper pipe are a radical departure in conducting systems for plumbing, heating or industrial use. Their unique method of connection has made it possible to use copper piping of hard temper and of a sufficient wall thickness to meet all requirements of actual service. This is in direct contrast to threaded copper pipe, which had to carry a very heavy wall to insure a sufficient thickness to meet service conditions after this thickness had been cut away approximately 50% in the fabrication of the thread. Threaded copper pipe for this reason is naturally very expensive and gives no extra service for its additional wall thickness on the unthreaded portion.

ILLUSTRATING MECHANICAL FEATURES OF THE STREAMLINE FITTING

STREAMLINE bronze fittings and copper pipe are installed at a price very slightly in advance of rustable materials.

STREAMLINE fittings and copper pipe are ideal for use in all types of educational buildings for all general plumbing and heating purposes: for steam supply, condensate return, cold water, drinking water supply and return, and hot water supply and return piping. Among the many advantages are:

No rusting or clogging—No discoloration of water from scale or rust, nor any decrease in volume or pressure such as is invariably found after a few years with corrodible materials.

Light weight, yet great strength — The STREAMLINE fitting, less heavy and consequently less expensive for any given size, produces a connection that is enormously strong and leakproof.

Minimum space required—Although STREAMLINE fittings produce enormously strong joints, they are very little larger than the pipe lines which they connect. They do not protrude like screw type fittings. Since these fittings are not screwed into place when connected to the pipe and no space is required for wrench handling, etc., they can be installed very close to each other, thus saving considerable space.

Leaks due to vibration eliminated—Constant vibration has no effect on a joint made with STREAMLINE fittings. Its effects are not localized as is the case with screw type fittings, but are harmlessly dissipated throughout the system.

Visual proof an exclusive feature of the Streamline Fitting.—When the mechanic installs STREAMLINE he can tell at a glance that the joint he has made is permanently leakproof without an actual pressure test. This is a valuable asset especially in concealed work.

The STREAMLINE fitting is not connected by threading or flaring but by soldering, utilizing one of nature's laws — capillary attraction — to form a permanently tight joint of great strength. The joint, in contrast to threaded connections, is actually reinforced and is the strongest point in the line, instead of the weakest.

Cut-away Sectional View of STREAMLINE Tee. Note How Pipe Is Recessed Into the Fitting, Resulting in a Uniform Smooth Waterway

The illustration herewith shows the mechanical features of the STREAMLINE fitting. After the joint has been fluxed and assembled in the pipe, it is heated and solder introduced through the feed hole. Capillarity immediately distributes it thoroughly and evenly between the bonding surfaces, producing a joint so strong that in a pulling test, the pipe will actually break while the joint remains without the slightest damage. It requires over 9000 pounds of pull even before the fracture in the pipe occurs. This, of course, is away beyond anything required of it in actual service.

ESPECIALLY RECOMMENDED FOR HEATING PLANTS

STREAMLINE hard copper pipe and fittings are particularly recommended for all heating plants—whether by hot water or steam—a special virtue of copper pipe being its capacity to hold heat with a minimum of radiation, yet to conduct it very rapidly, so that there is a minimum loss of heat when being conveyed from the point of generation to the points of distribution. Since copper cannot rust, the original delivering capacity of STREAMLINE pipe remains the same indefinitely. In all heating plants, we claim greatly increased benefits in all installations made with STREAMLINE, with noteworthy savings in both fuel and material.

STREAMLINE pipe and fittings are installed in over three hundred schools and colleges throughout the United States and in fact in every type of building construction. They have been specified by leading architects everywhere.

STREAMLINE fittings are furnished in complete range from ¼″ to 10″.

Write for Catalog F.

THERMAX

DIVISION NORTHWEST MAGNESITE COMPANY

Farmers Bank Building
Pittsburgh, Pa.

PRODUCTS

Thermax Insulation, partition blocks, furring and roof slabs.

Absorbex Acoustical Corrective.

THERMAX PARTITIONS

Thermax Partitions are fireproof, highly soundproof and earthquake proof. They are light in weight, economically erected, and offer a true surface and excellent bonding key for plaster or stucco.

Thermax is also used in connection with reinforced concrete floor construction forming; sound-deadening plaster base, and for suspended ceiling construction and sound insulation of ducts in connection with air-conditioning systems.

Sizes: 1″ x 20″ x 64″
2″ x 20″ x 64″
3″ x 20″ x 64″
or 32″

Insulation Value—.46 B.t.u. per inch

Sound Deadening Value—35 to 47Db reduction

Weight—2.2 lbs. per sq. ft. per inch thickness

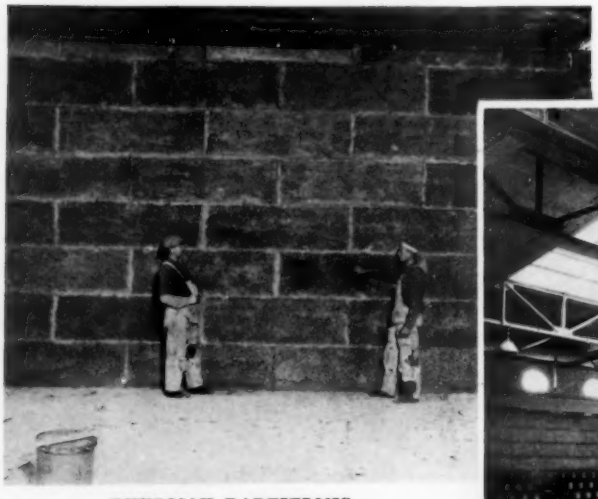
ABSORBEX ACOUSTICAL CORRECTIVE

Absorbex is non-inflammable, and can be repainted many times without affecting its sound absorbing qualities—is permanent and decorative.

Absorbex has been tested by the official laboratories of the Acoustical Materials Association, and is listed in the Association literature as having high absorption coefficients.

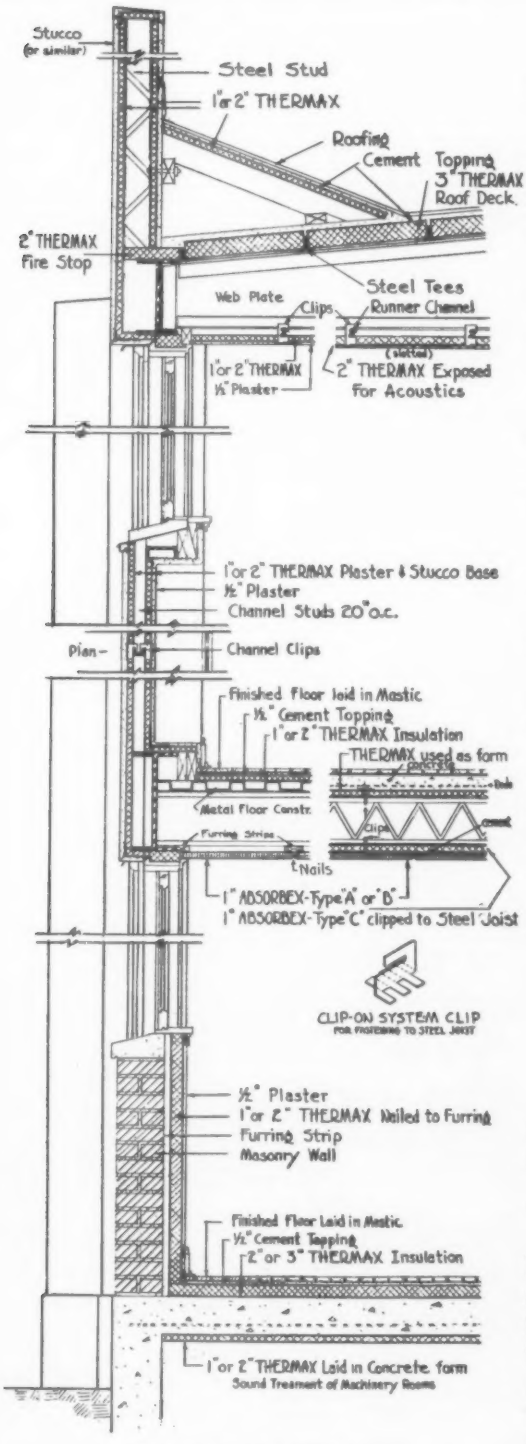
Absorbex is particularly adaptable to auditoriums, gymnasiums, cafeterias, offices, corridors and classrooms. It is installed by approved contractors skilled in the technique of application and with thorough knowledge of the engineering principles as applied to architectural acoustics and sound insulation.

See Sweet's Architectural Catalog or write THERMAX, Farmers Bank Building, Pittsburgh, for complete details.



THERMAX PARTITIONS
FIRE AND EARTHQUAKE PROOF

ABSORBEX ACOUSTICAL CORRECTIVE
INCOMBUSTIBLE AND PERMANENT



COMPOSITE DETAIL
ILLUSTRATING TYPICAL USES OF THERMAX FIREPROOFING INSULATION AND ABSORBEX ACOUSTICAL CORRECTIVE FOR
SCHOOL CONSTRUCTION

THERMAX

FIREPROOFING — Fulfills requirements of Board of Fire Underwriters and Building Codes.

EARTHQUAKEPROOF—Thermax absorbs the shock without affecting plaster or stucco facing.

LIGHTWEIGHT—Thermax minimizes the combined weight of adaptable construction.

UNIFORMITY — Rigid factory supervision assures a uniform product.

REASONABLE COST—Fire resistance, structural characteristics and insulation efficiency, combined in one material, make the comparative cost of Thermax low.

EASE OF ERECTION—Thermax is easily and rapidly erected.

EXPANSION AND CONTRACTION—Installations show no defects due to expansion or contraction under various climatic conditions.

VERMIN PROOF—Fire resisting cement binder is unattractive to vermin-termite.

FUNGI PROOF—Shows unusual resistance to the attack of fungus or dry rot.

MOISTURE RESISTANCE—Non-capillary.

THERMAL CONDUCTIVITY — .46 B.t.u. per hr., per sq. ft., per degree F., per inch thickness.

SOUND INSULATION — Thermax is recommended for sound deadened partitions and sound isolation for machinery rooms, and sound filters and baffles in air conditioning systems.

STRUCTURAL STRENGTH — Thermax satisfies Building Code requirements for insulated load-bearing roof decks and floors, fireproof non-bearing partitions, sheathing and plaster and stucco base.

ABSORBEX

INCOMBUSTIBLE TILE FORM

SOUND ABSORPTION efficiency range up to .98

TYPES and SIZES provide full range of sound control

INERT to temperature and humidity changes

STRUCTURAL STRENGTH

HIGH LIGHT REFLECTION

LOW COST per unit of absorption

ADAPTABLE to any architectural design

TEXTURE interesting and non-mechanical

STERILE

LOW MAINTENANCE COST

REDECORATED with lead and oil paint without loss of efficiency.

WESTINGHOUSE ELECTRIC & MFG. CO.

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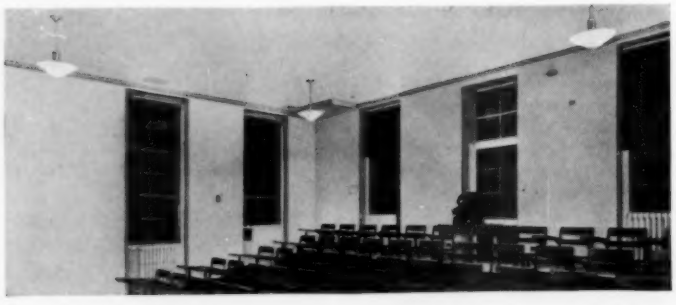
LARGEST MAKER OF COMPLETE LIGHTING EQUIPMENT

...WITH COMPLETE EQUIPMENT FOR EVERY SCHOOL AND UNIVERSITY NEED

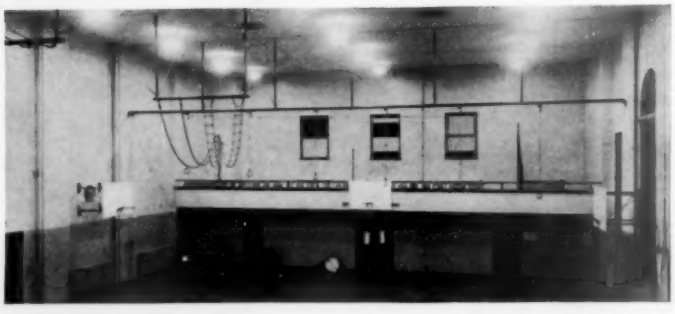


Class Rooms and Libraries

Westinghouse luminaires provide scientifically correct illumination for eye comfort and eye conservation. There is a style for every type of application. The units cost no more than ordinary equipment. Ask for Westinghouse Commercial Catalog, Form 61-200.

Gymnasiums and Laboratories

Westinghouse equipment meets every exacting requirement in gymnasiums, laboratories and work shops. It offers the most practical combination for efficient, economical and attractive illumination. For complete details, ask for Westinghouse Catalog, Form 61-100.



Athletic Fields and Swimming Pools

Westinghouse equipment will accomplish any desired floodlighting effect at minimum cost. Standard apparatus will equip any application from fountain lighting to strictly utilitarian lighting. Complete details and illustrations are contained in Floodlighting Catalog, Form 61-800.

THE AMERICAN SCHOOL AND UNIVERSITY

GAS-ELECTRIC SETS

Westinghouse Gas-Electric Sets, from 800 watts to 75-kw. either a-c. or d-c., make possible an unfailing source of power supply, either by providing the normal source of supply continuously, or as an emergency standby for the normal source of supply whether it is individual plant or central station service. Either type of service may be supplied automatic or non-automatic.

These gas-electric sets are so designed and constructed that they may be used for either stationary or portable applications.

Automatic gas-electric sets may be supplied for operation with gasoline, natural or artificial gas as standard. Non-automatic sets also may be supplied for operation with kerosene for special applications. All sets operating on artificial or natural gas of a quality less than 700 BTU's per cubic foot must be derated 10 per cent.

These powerful, sturdy, engine generator sets are designed and built by experts in the design and construction of automatic control devices, and every possible feature is incorporated to insure reliable, unfailing service. Each part of the set, including engine, generator, exciter and starting battery, is designed for economy in maintenance as well as high efficiency.

MICARTA TRAYS

For Cafeterias and Laboratories

These trays are quiet, light in weight, easily kept hygienically clean and therefore are exceptionally well suited for use in school and college cafeterias and restaurants.

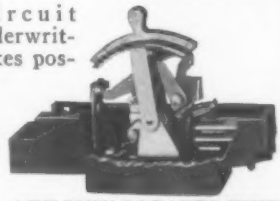
MICARTA TRAY

Also because alcohol, moisture, most acids and alkalis have no effect on Micarta trays, they are used in laboratory work where ordinary trays prove unsatisfactory.

Micarta trays have a smooth satin finish that time and use will not mar. Made in straight grain or burl walnut, curly maple, black and in fancy decorative designs: 9½ x 12½ in., 10¾ x 13⅞ in., 13⅝ x 17⅝ in., 15⅜ x 20¾ in., 16½ x 22½ in.

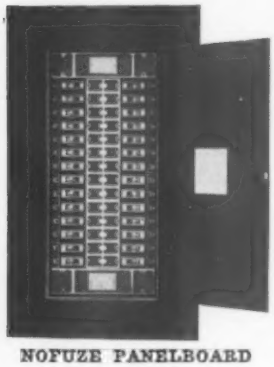
FUSELESS PROTECTION

The "De-ion" circuit breaker unit has Underwriter's approval and makes possible fuseless circuits of 15 to 600 amperes, 125, 250, or 600 volts for buildings. This unit with modifications is used in meter Entrance Breakers, Nofuze Panelboards, Nofuze Power Distribution Panelboard, on switchboards, in a cabinet as a safety switch; instead of switches and fuses and in Load Centers where a small number of circuits are required. Thus it is possible to have complete fuseless protection from point of entry to final location.



"DE-ION" BREAKER UNIT

Convenient, safe and tamper-proof, no fuses to replace, tripped breaker quickly detected because of handle position, and easily reclosed, are important advantages. Additional advantages are:



NOFUZE PANELBOARD

1. Can be reclosed by anyone as easily as a switch. Safe, nothing to replace or to renew.
2. Time lag prevents unnecessary tripping on slight, momentary overloads.
3. Cannot be held closed against an abnormal overload or short circuit.
4. Cannot be blocked to prevent its opening the circuit.
5. Rating cannot be changed by unauthorized persons.
6. Requires small mounting space.
7. Opens a short circuit without undue flash or noise.
8. No live parts accessible.

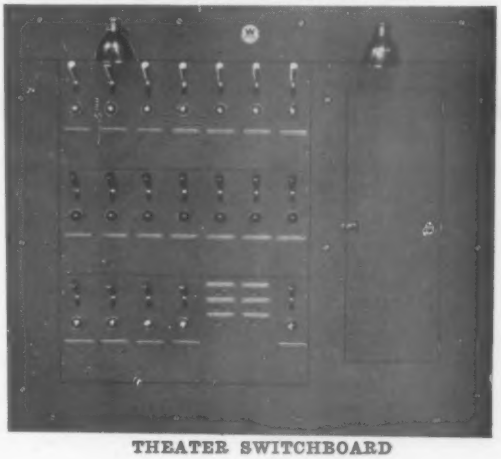
PANELBOARDS

Westinghouse manufactures a complete line of panelboards to meet all lighting control applications. Type NA1B Nofuze lighting and distribution panelboards are equipped with "De-ion" circuit-breakers in place of the conventional switches and fuses.

THEATER SWITCHBOARDS

Westinghouse builds seven types of theater switchboards to meet the varied needs for control of colored lighting effects. Light, properly controlled, can add much to the effectiveness of the play or act. The audience, under the influence of colored light, unconsciously absorbs the spirit behind the production.

Complete information on theater switchboards can be obtained from the nearest Westinghouse office.



THEATER SWITCHBOARD

AMERICAN ABRASIVE METALS CO.

FERALUN—BRONZALUN—ALUMALUN—NICALUN

Names Reg. U. S. Pat. Off.

Irvington, New Jersey

New York City Office: 50 Church Street

BRANCH OFFICES

BOSTON, 528 Commonwealth Avenue
CHICAGO, 111 W. Washington Street
LOS ANGELES, 2071 Laura Avenue
PHILADELPHIA, 1700 Walnut Street
PITTSBURGH, Farmers Bank Building
SAN FRANCISCO, 405 Call Building

AGENTS IN PRINCIPAL CITIES

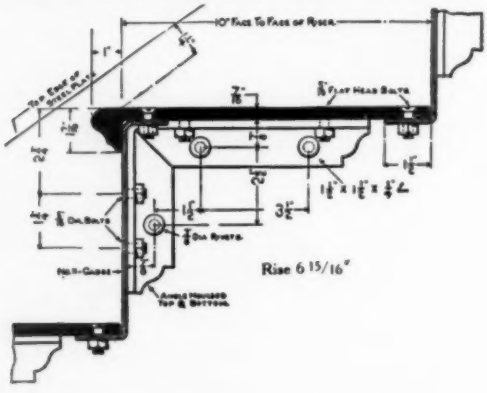
HATCH SURFACE

FERALUN
Anti-Slip Treads

Spell SAFETY in Your School

PLAIN SURFACE

FOR NEW BUILDINGS—STYLE "S"



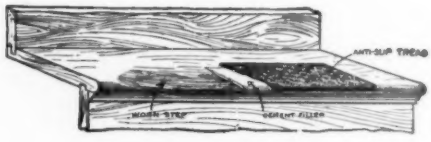
THE STYLE "S" STRUCTURAL TREAD

has been especially designed for school installation. Its acceptance by architects and school boards is becoming steadily wider. It affords the most economical as well as the most satisfactory method of insuring safe anti-slip stairways, with complete and permanent freedom from the expense and annoyance of repairs or renewals.

Style "A"
WITH METAL ANCHORS FOR NEW CONCRETE STEPS

SAFE STAIRWAYS PREVENT ACCIDENTS

FOR REPAIR WORK—STYLE "A"



THE STYLE "A" TREAD

is widely used for the repair of worn stairs. Typical conditions are shown above. Repairs so made are inexpensive and permanent.

This type of tread is also recommended for use with new concrete stairs.

FERALUN—BRONZALUN—ALUMALUN—NICALUN

The abrasive treads with the deeply impregnated grit.

Originators and developers of abrasive metal treads.

Write for details and prices

SPECIFY FERALUN AND BE SURE

THE AMERICAN SCHOOL AND UNIVERSITY

AMERICAN DISTRICT STEAM CO.

OVER FIFTY YEARS IN BUSINESS

North Tonawanda, N. Y.

BRANCHES AND AGENTS IN PRINCIPAL CITIES

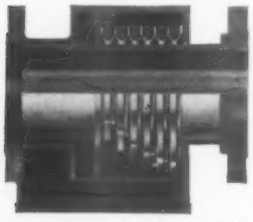
STEAM DISTRIBUTION EQUIPMENT

The American District Steam Company manufactures a complete line of products for the economical distribution of steam, based on over 50 years' experience as one of the pioneers in the design and construction of district heating equipment.

When planning new construction or the replacement of steam lines and steam equipment, consult ADSCO engineers for practical recommendations, prices and discounts on Expansion Joints; Condensation and Steam Flow Meters; Steam Traps; Storage and Instantaneous Water Heaters; Radiator Traps and Valves; Wood Casing for insulating underground steam lines, and related equipment. Write for illustrated Bulletins.

ADSCO Expansion Joints

ADSCO Expansion Joints, to care for pipe expansion and contraction in underground or surface steam and hot water lines, are made in both the slip type and packless type for pressures to 400 lbs. There is an ADSCO Expansion Joint for every purpose and ADSCO engineers will submit recommendations based on your individual requirements. Write for Bulletin Nos. 35-5 to 35-55.



PACKLESS EXPANSION JOINT, U-RING TYPE

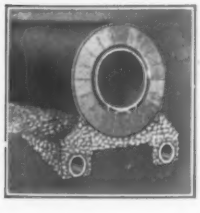
ADSCO Vertical Steam Trap

VACUUM SERVICE
To 15 lbs. Pressure

GRAVITY SERVICE
0 to 125 lbs. Pressure

The ADSCO Vertical Steam Trap is a continuous flow, float type trap with direct vertical inlet and outlet connections and a 90° inlet connection. All working parts are mounted on the cover, all piping connections on the body. It has a reversible valve and reversible seat, giving a double life trap at no extra cost. The cover can be removed quickly and the mechanism serviced easily without disturbing the piping. Write for Bulletin No. 35-85A.

ADSCO Red Diamond Brand Casing



This wood casing is the ideal combination conduit and insulation for underground steam lines. It can be installed rapidly at low labor cost and is 91% efficient—many installations found to be perfect after 25 and more years of service. Write for Bulletin No. 35-65.

ADSCO Storage and Instantaneous Water Heaters

STORAGE HEATER, HORIZONTAL U-TUBE TYPE

ADSCO Storage Water Heaters, of welded or riveted construction, horizontal, U-tube type, are made in any combination of storage and heating capacity. The copper U-tube heating elements, to transfer heat from live, exhaust steam or other heating medium to the water, are designed for working steam pressures to 125 lbs. per square inch.

ADSCO Instantaneous Water Heaters are made in 21 sizes from capacities of 35 gals. to 16,000 gals. per hour. Write for Storage Heater Bulletin No. 35-75 or Instantaneous Heater Bulletin No. 35-76.

ADSCO Rotary Condensation Meter

Measure the steam consumption of heating systems, individual buildings, hot water heaters, cooking, laundry or other steam equipment with the ADSCO Rotary Condensation Meter. It operates under vacuum or gravity conditions and is accurate within 1%. Available in 7 sizes from 250 to 12,000 pounds of water per hour. Write for Bulletin No. 35-80.

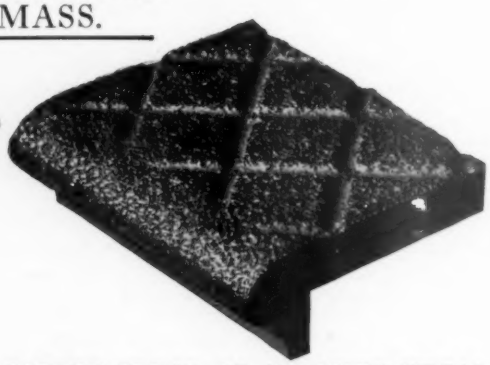
ADSCO Radiator Traps, Valves and Heating Specialties

Write for Bulletin describing the high grade ADSCO line of Radiator Valves, Thermostatic Radiator Traps and other vapor heating specialties.

AMERICAN DISTRICT STEAM COMPANY
NORTH TONAWANDA, N.Y.

AMERICAN MASON SAFETY TREAD CO.

GENERAL OFFICE AND FACTORY
LOWELL, MASS.



PREVENT ACCIDENTS WITH AMERICAN MASON SAFETY TREADS

American Mason Safety Treads provide almost complete immunity from slipping. In addition, they insure greater durability for stairs of any type. They are especially desirable for stairs in school buildings wherever the traffic is heavy, for thresholds of doors, and for ramps and floors around heavy machinery in school shops. Suitable for use on granite, marble, slate, cement, iron or wood—new or old construction—they are especially desirable on concrete stairs, as they prevent the raw edge from chipping off.

REPAIR WORN STAIRS WITH AMERICAN MASON SAFETY TREADS

For repairing purposes, Mason Safety Tread is ideal. The worn portion of the stair is built up to the level with Karbolith or cement filling, on which is placed the Safety Tread. Steel, Brass or Aluminum Nosings may be attached to the Safety Tread for attractive finish or to cover up the filling on badly worn stairs.

Our long experience enables us to give directions for the repair of any stairway, of any material and any degree of wear. We will furnish without obligation suggestions, sketches or blueprints, showing just how the work can best be accomplished and at the lowest cost.

A SAFETY TREAD OF ABRASIVE METAL

Above is shown a special cast metal type of American Mason Safety Tread, in which a carborundum or aluminous abrasive has been embedded in the wearing surface of the molten metal. The flint-like particles of the abrasive project above the surface, which effectively prevents slipping, whether wet or dry. The treads can be furnished in three surfaces—fluted, diamond-hatched as above, or plain. The body metal may be of iron, bronze, aluminum or nickel, dependent upon the type of service for which the tread is intended or the architectural effect desired. Certain styles require no subtread and can be used with or without a riser. These treads are easily and quickly installed on either new or old work.

MASON ROLLED STEEL OR EXTRUDED BRASS DOOR SADDLES

These are recommended wherever appearance and protection against wear and slipping are desired. Door Saddles are furnished with corrugated surface as illustrated, cut to required length, drilled and countersunk for screws.

BEFORE REPAIRING

AFTER REPAIRING

Write for a copy of our illustrated booklet and the name of our nearest agent

ARCH ROOF CONSTRUCTION CO., Inc.

Engineers and Contractors

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CHickering 4–3516

55 West 42nd Street, New York, N. Y.

DISTRICT ENGINEERS

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[Tel.: Dearborn 7918]
Detroit, Mich., Martin A. Preston, 8 Ridgemont Rd.
Los Angeles, Cal., Bert E. Anderson, 9129 W. Adams St.
San Francisco, Cal., Rolph, Mills & Co., 525 Market St.

LONG SPAN ROOF ARCHES

Scope of Application and Service

Design, Construction and Erection of Long Span Roof Arches for theaters; auditoriums; convention, exhibition and fair buildings; garages; warehouses; factories; airplane and dirigible hangars; gymnasiums; skating rinks; bowling alleys, and all buildings where unobstructed space, maximum light and ventilation are desired.

Arch Roof Construction Co., Inc., will design arches, supply all materials and do the erection, or ordinary materials can be supplied and erection done by local contractors.

Swarthmore College Field House
Photo taken Dec. 26, 1935, during construction

Field Buildings

Our field or sports buildings can be erected for use as an auditorium, theater, gymnasium, ice hockey, etc. These buildings are easily interchangeable (without structural changes) permitting daily varied uses of one efficient building instead of requiring several infrequently used buildings.

Spans to Over 400 Feet

We use short lengths of the usual structural materials in the design and economical construction of buildings having spans up to 400 feet or more, where unobstructed space (no columns, posts or trusses) is desired. Heights to suit.

Strength

Arch roof construction can be of timber or steel or a combination of both. Standard structural shapes and sizes are employed in a patented design with patented connections to produce a roof of unusual strength. It may be fireproof, fire-retardant or non-fireproof.

Design

All our arches are scientifically designed as hingeless, one, two, or three-hinged arches, and any competent structural engineer can design and check our arches.

In our design, ample provision is always made for all dead, live and unbalanced loads, rib shortening, temperature variation, etc.

Olympic Arena, Lake Placid, N. Y.

Advisory Service

We will gladly provide information and suggestions to school officials, architects, and engineers on the most economical and efficient designs for these buildings. A request will bring additional information.

United States Patents

1,480,882, January 15, 1924
1,639,930, August 23, 1927
1,783,958, December 9, 1930
1,795,331, March 10, 1931
1,891,346, December 20, 1932
2,021,480, November 19, 1935

Canadian Patents

329,165, January 10, 1933
331,206, March 28, 1933

Great Britain Patents

382,138, January 18, 1932

Other Patents Pending

THE BARRETT COMPANY

Manufacturers of Roofing and Waterproofing Materials

40 Rector Street, New York, N. Y.

2800 So. Sacramento Avenue, Chicago, Illinois — Birmingham, Alabama
In Canada: The Barrett Company, Limited, 5551 St. Hubert Street, Montreal, P. Q.

Products

ROOFING MATERIALS—For Flat Surfaces: Barrett Specification Pitch and Barrett Specification Felt; Black Diamond Pitch and Black Diamond Felt.

For Steep Surfaces: Barrett Specification Felt, Barrett Steep Roofing Pitch, Anchor Asphalt and S.I.S. Roofing. Barrett Asphalt Shingles and Roll Roofings.

MISCELLANEOUS—Waterproofing for foundations, swimming pools, tunnels, floors, etc., special specifications submitted. Insulating and Building Papers, for sheathing, lining, etc. Damp-proofing and Protective Paints, Wood Preservatives. Tarvia-lithic for playground surfacing, roadways, paths and tennis courts.

THE TECHNICAL SERVICE BUREAU of The Barrett Company invites your consultation with its technically trained staff, without cost or obligation. Address The Technical Service Bureau, The Barrett Company, 40 Rector Street, New York.

Specified for America's Finest School and College Buildings

Barrett Roofs protect thousands of America's schools . . . in Boston 76 schools are Barrett-roofed, in Philadelphia, 62 schools are Barrett-roofed, in Hartford, 26. . . . Such outstanding preference for Barrett coal-tar pitch and felt roofs can only be explained by the roofs themselves.

Barrett Specification Roofs combine the maximum of protection and fire-safety with the minimum cost per-year-of-service. They carry Fire Underwriters' Class A rating. They are bonded against repair and maintenance expense by the United States Fidelity and Guaranty Company for 20 years, and regularly outlive the bonded period by decades.

Barrett Approved Roofers, who can offer you complete Barrett Roof Service, apply Barrett Specification Roofs. There is one located near you. Consult with him or with us on any roofing or waterproofing problem.

Free Roof Inspection

On request, Barrett will send a trained roof inspector to make a careful survey of your roofs, flashings, copings, parapets, etc., and render a complete, unbiased report. This service is free everywhere east of the Rockies, and has been the means of saving thousands of dollars in up-keep expenses. Let us arrange an inspection for you.

Barrett ROOFS

THE FAMOUS PUBLIC LATIN SCHOOL IS ONE OF 76 BARRETT-ROOFED SCHOOLS IN BOSTON
Architects: McLaughlin and Burr, Boston. Roofers: Cavanaugh and Earley, Inc., Cambridge.

THE PHILIP CAREY COMPANY

Manufacturers of

ROOFING AND WATER-PROOFING PRODUCTS, HEAT INSULATIONS

Lockland, Cincinnati, Ohio

The roof of a school building represents little more than 1% of the total construction cost yet on its durability and weather-resisting qualities depend the protection of the other 99%. The school roof should be designed and built to last the life of the building. Re-roofing is an expense that need not be incurred under ordinary conditions if the right roof is selected and properly constructed.

SPECIFY

Carey ROOFS

FOR LASTING PROTECTION

Carey Roofs meet every requirement for modern school construction. For more than sixty years Carey Roofs have been specified for important public buildings throughout the United States, and their application to new school construction is increasing year by year because they have proved their durability and lasting protection against weather.

The quality of materials entering into Carey Built-Up Specifications are carefully checked by our engineering department and research laboratory, allowing a liberal factor of safety as to tensile strength, number of plies and thickness of plies, to assure adequate and permanent weather-proof protection.

FREE ROOF SURVEY

The Carey Roof Survey Plan has been in operation for several years and has been the means of cutting roofing upkeep expense to a minimum. Without obligation on your part, a Carey Inspector will make a careful survey of your roofs, flashings, parapets, etc., and give an honest and impartial report on their condition.

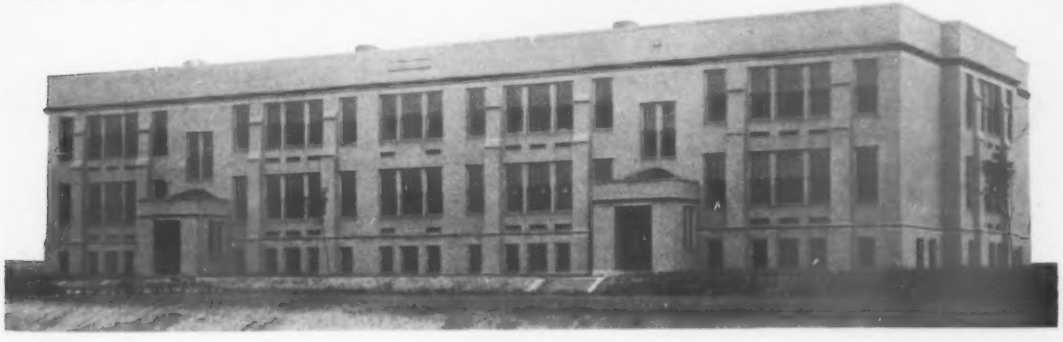
Carey Asfaltslate Shingles represent the standard of quality in composition shingles. They are built especially rugged and substantial to give extra years of trouble free service. They are proof against all ordinary fire risks and need no paint or other upkeep expense. Be sure to see the Carey Cork Insulated Shingle which is constructed to provide roof insulation that is automatically applied at the same time the roof is put on.

Careystone Asbestos Cement Shingles. Made of asbestos and cement, it provides a permanent roof possessing natural properties that enable it to resist the destructive influences of time, weather and fire.

Carey Heat Insulations. For low pressure steam or hot water heating systems, Careycel Pipe Covering has no equal. It combines high insulating efficiency with low cost. The Carey Heat Insulation Line is complete. A special insulation material to meet every service condition. Temperature ranges from zero to 2500° F.

Carey Waterproofing Materials. Carey waterproofing product for basement walls and swimming pools; Protective coatings to repair leaks and prolong the life of all types of roofs, protection paints for hot and cold metal surfaces.

For complete information on Carey Roofs and other products, write The Philip Carey Company, Lockland, Ohio.



THE AMERICAN SCHOOL AND UNIVERSITY

COLUMBUS COATED FABRICS CORP.

Columbus, Ohio

Bontex Pyroxylin Impregnated Shade Cloth is widely used by schools because it so ably withstands years of hard service.

It is ideal for use in public buildings. Despite rough and frequent handling, it does not fray, pinhole or crack. No annoying specks or lines of light can show through to disturb classroom activities. Yet Bontex Shade Cloth is scientifically translucent to allow a sufficient fusion of light, even when shades are fully drawn.

Bontex Shade Cloth is sunfast. Constant exposure to burning sun will not change its color. It is easily washable. As often as 20 or more times, the original freshness and coloring can be renewed by simply scrubbing with soap and hot water. The fine finish and colorings remain unimpaired.

Bontex is a pyroxylin impregnated shade cloth of the highest quality. It is washable, sunproof, does not fray, pinhole or crack. Bontex will retain its original finish through years of hard service.

Bontex Shade Cloth meets all the requirements for good window shades, including Government Specifications CCC-C-521 and DDD-S-251. Its fastness to sunlight, tensile strength, resistance to washing, rain and abuse, were thoroughly established by most rigid tests in independent commercial laboratories, including Delineator and Lux Laboratories, and South Florida Test Service.

Bontex Shade Cloth (translucent, semi-opaque and opaque) is made in a full range of plain colors. **Write to Columbus for Bontex samples.** We will send address of the Bontex distributor in your locality.

BROOKLYN TECHNICAL HIGH SCHOOL, BROOKLYN, N. Y.

EQUIPPED THROUGHOUT WITH BONTEX WASHABLE WINDOW SHADES

PAUL COSTE, INC.

Providence, Rhode Island

SCHOOL FLOORS—Two Types

DURITE — the Asphalt Tile Reenforced with Rubber

ROYALITE—the Architectural Rubber

DURITE — Its Advantages for Floors of School and College Buildings

1. Waterproof, fireproof, safe, not slippery
2. The only type of resilient flooring that can be laid in basements
3. Outwears every other kind of resilient flooring
4. The lowest cost floor tile in the world
5. Developed in the world's largest rubber laboratory
6. The only asphalt tile reenforced with rubber
7. Beautiful yet inexpensive
8. Easily maintained and kept clean at low cost

STANDARD GAUGES

⅛″ 3/16″ ¼″

STANDARD SIZES

3x3″	6x12″	6x18″	18x27″
4x4″	9x9″	12x12″	6″ hexagon
3x6″	9x18″	9x27″	9⅝″ hexagon
6x6″	8x12″	12x24″	12″ hexagon

Columbia University Library, New York

Colors

14 textured colors; 15 solid colors.

ROYALITE

Wherever in a school building it is desired to have a flooring of extraordinary beauty and comfort, we recommend **Royalite,** the **Rubber Floor of Quality,** the first rubber flooring ever produced in fine texture and color. A **Royalite** floor is soft and resilient to walk upon, beautiful to look upon. It is an ideal floor for libraries, private offices, infirmaries and other rooms of special character where silence and durability are prime requisites.

STANDARD SIZES

4x4″	9x9″	6x12″	18x48″	36x48″
6x6″	12x12″	9x18″	18x45″	36x45″

Also Diagonal half tile from above sizes.

Booklets available upon request

Millions of feet have been installed. A few of the most prominent school users are listed below:

Columbia University Library, New York

Providence Public Schools, Providence, R. I.

A. & M. College, College Station, Texas

Congressional Library, Washington, D. C.

Enoch Pratt Library, Baltimore, Md.

St. Louis University, St. Louis, Mo.

University of Chicago, Chicago, Ill.

Brown University, Providence, R. I.

Cornell University, Ithaca, N. Y.

Warwick, R. I., High School

Chicago Public Schools

THE ELECTRIC STORAGE BATTERY CO.

World's Largest Manufacturers of Storage Batteries for Every Purpose

Allegheny Avenue and Nineteenth Street, Philadelphia

BRANCHES IN 17 CITIES THROUGHOUT THE UNITED STATES

SAFEGUARD YOUR AUDITORIUMS AND GYMNASIUMS

WITH

Automatic and instantaneous in operation

Exide Keepalite

Emergency Lighting System can be had for as little as $150

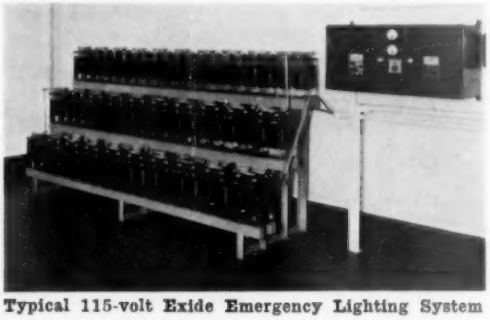
EMERGENCY LIGHTING BATTERY SYSTEMS

Your auditorium or gymnasium is crowded with pupils at lectures, plays, sports, or dances. What would happen if lighting current should suddenly fail?

Total darkness would result. Even exit lights would be useless. Inconvenience, confusion and danger might easily follow. Unfortunately, lighting failures do happen, despite every precaution taken by light and power companies to prevent such service interruptions. They are powerless to prevent electrical, rain, sleet, snow and wind storms from bringing down power lines which quite frequently cut off the electric service to towns and even whole groups of communities. Fires, floods, explosions, street accidents, blown fuses and short circuits also contribute to the total of power interruptions. The dangers of lighting failure can be eliminated in your school with an absolutely dependable Exide Emergency Lighting System. They are **automatic** and **instantaneous** in operation. Can be had for as little as $150.

Areas up to 10,000 square feet can be protected with Exide-Keepalite. Keepalite furnishes a dependable source of emergency lighting current which may be concentrated within a limited area to provide light equalling normal lighting; or, it may be used to supply enough light for visibility in larger areas.

The Exide-Keepalite self-contained low voltage emergency lighting system supplies a separate source of electric current to its own high efficiency low voltage lamps. Keepalite consists of: an Exide Battery, automatic relay, battery charger, signal and switches—all assembled in a compact, attractively finished case.



Typical 115-volt Exide Emergency Lighting System

Exide Keepalite, the new low voltage emergency lighting system, $150

Wherever emergency lighting protection is required for larger areas or entire buildings, large 115-volt Exide Emergency Lighting Systems are available. These systems consist of Exide Batteries and reliable devices to automatically control and charge the battery. The operation of these systems is absolutely dependable. Furthermore, they are self-sustaining since they **automatically** and **instantaneously** furnish the needed electric current during the full emergency period without a hand touching a switch, and because they automatically recharge the battery after the emergency discharge.

Dependable Exide Laboratory Batteries Available in Any Size, See Page 400

Established 1866 Telephone: BArclay 7-3560

G & G HOIST CORPORATION

SUCCESSORS TO GILLIS & GEOGHEGAN, INC.

Manufacturers of G & G Telescopic Hoists and Equipment

11 Park Place, New York, N. Y.

Factory: 98 Snediker Avenue, Brooklyn, N. Y.

SALES REPRESENTATIVES

Albany, N. Y., Albany Bldrs. Supply Co.
Atlanta, Ga., Applewhite & Lawler.
Birmingham, Ala., James R. Adams Co.
Boston, Mass., A. C. Deming.
Baltimore, Md., V. D. Eastwood.
Buffalo, N. Y., Jones Iron Works.
Cincinnati, Ohio, Durbrow & Otte.
Cleveland, Ohio, Vance Hives & Co.
Chicago, Ill., S. I. Kaufman.
Columbus, Ohio, F. L. Purdy Co.
Charlotte, N. C., R. Gallaway Ross.
Detroit, Mich., O. H. Dawson.
Dallas, Tex., R. J. DeWees.
Des Moines, Iowa, Hawkeye Engineering Co.
Dayton, Ohio, F. G. Kemper & Co.
Grand Rapids, Mich., T. K. Bender.
Los Angeles, Cal., B. L. Wilcox Co.
Indianapolis, Ind., Stackhouse Bldg. Specialties Co.
Kansas City, Mo., C. S. Hawley Co.
Louisville, Ky., R. B. Tyler Co.
Milwaukee, Wis., Allan Engineering Co.
Minneapolis, Minn., Morgan Gerrish Co.
Nashville, Tenn., John Williams Co.
New Haven, Conn., H. Dumelin & Sons.
Norfolk, Va., J. S. Jones.
Oklahoma City, Okla., Federal Supply Co.
Pittsburgh, Pa., James R. Pitcairn.
Philadelphia, Pa., Charles Clement.
Roanoke, Va., Roanoke Eng. Sales Co.
Rochester, N. Y., S. A. Spencer.
San Francisco, Cal., Vincent Whitney Co.
St. Louis, Mo., Hunkins Willis Lime & Cement Co.
Syracuse, N. Y., B. R. Johnson.
Scranton, Pa., LaBar & Evans.
Toledo, Ohio, S. L. Everitt.
Utica, N. Y., American Hard Wall Plaster Co.

IMPORTANT ANNOUNCEMENT

G & G Hoist Corporation have purchased and are the sole owners of all the patent rights to telescopic hoists, and patent rights to ash-hoist equipment, formerly held by Gillis & Geoghegan, Inc.; the trademark, G & G Telescopic Hoist; all books and records of the ash-hoist business conducted formerly by Gillis & Geoghegan, Inc., together with all patterns and blue prints; and is the successor to Gillis & Geoghegan, Inc., in the production and manufacture of the G & G Telescopic Hoist and all G & G ash-hoist equipment.

MODEL E ELECTRIC HOIST

The G&G Telescopic Hoist with Automatic Gear Shifting Brake Device and Silencer

G & G TELESCOPIC HOISTS

All G & G Hoists are now made with **anti-friction bearings throughout**, further assuring (1) **ease of operation**, (2) **dependability** and (3) **long wear**, all of which have been outstanding features of G & G Hoists even before this noteworthy improvement was adopted.

MODEL A Anti-friction Bearing Manual Type Hoist
For raising maximum loads of 500 lbs. at a speed of 30 f.p.m. from Basement to Grade Level.

MODEL B Anti-friction Bearing Manual Type Overhead Crane Hoist
For raising maximum loads of 300 lbs. at a speed of 30 f.p.m. from Basement to a position of 6 ft. above Grade Level—dumping cans directly into truck without rehandling at grade.

MODEL BW Anti-friction Bearing Manual Type Hoist
For raising maximum loads of 500 lbs. at a speed of 30 f.p.m. Loads can be raised and swung through a window or doorway.

MODEL E Anti-friction Bearing Electric Type Hoist with Motor Located on Hoisting Head (illustrated at left)
For raising maximum loads of 500 lbs. at a speed of 60 f.p.m. from Basement to Grade Level.

MODEL D ANTI-FRICTION BEARING ELECTRIC TYPE OVERHEAD CRANE HOIST WITH MOTOR LOCATED IN BASEMENT
For raising maximum loads of 500 lbs. at a speed of 60 f.p.m. from Basement to a position 6 feet above Grade Level—dumping cans directly into truck without rehandling at grade.

MODEL D3 ANTI-FRICTION BEARING ELECTRIC TYPE OVERHEAD CRANE HOIST WITH MOTOR LOCATED ON HOISTING HEAD
For raising maximum loads of 300 lbs. at a speed of 60 f.p.m. from Basement to a position of 6 feet above Grade Level—dumping directly into truck without rehandling at grade.

G & G IMPROVED HOISTING CANS

Remain stationary for easy hooking and raising. These cans are particularly recommended for their labor-saving features.

Types of G & G Improved Hoisting Cans

Fig. A: G & G Standard 16-gauge 17-24 in. Side Handle Hoisting Can—Where the convenience of the fixed bail feature is not desired, this can will be found very useful for general purposes and will outlast several ordinary cans. **Weight:** 42 lbs.

Fig. B: G & G Standard 16-gauge 17 x 24 in. Fixed Bail Hoisting Can—Recommended for use with Models A, BW and E because it is easy to hook preparatory to raising. **Weight:** 42 lbs.

Fig. C: G & G Standard 16-gauge 17 x 24 in. Swing Bail Hoisting Can—Recommended for use with Models B, D and D3. Swing Bail remains stationary for hooking preparatory to raising. **Weight:** 45 lbs.

Fig. A **Fig. B** **Fig. C**

G & G IMPROVED HOISTING CANS
Standard 16-gauge, 17 x 24". A—Side Handles. B—Fixed Bail. C—Swing Bail.

GLEASON-TIEBOUT GLASS CO.

Manufacturers of
LIGHTING GLASSWARE

CELESTIALITE DIVISION
200 Fifth Ave., N. Y. City

MAIN OFFICE
99 Commercial St.
Brooklyn, N. Y.

Products

CELESTIALITE (Reg. U. S. Pat. Off.)
A scientific combination of three layers of glass:

1. An outside clear layer for body and strength.
2. A middle white glass layer to diffuse and soften the light.
3. An inner blue transparent glass layer to whiten and improve the quality of the light.

SILVAGLO
A highly efficient single layer glass of a different opal mixture.

CELESTIALIER (Reg. U. S. Pat. Off.)
A scientific combination of the best features of indirect and direct lighting. Using a special fixture of Celestialite and Anodic Aluminum to produce an efficient light source. Ideal for office, auditorium and library.

PROMINENT EDUCATIONAL INSTALLATIONS

Amherst
Columbia
Princeton
University of Florida
Wells College
Wellesley
University of Texas
University of West Virginia
City of Boston
City of Mt. Vernon, N. Y.
City of Rochester, N. Y.
City of New York, N. Y.
Etc., Etc.

A report rendered by a non-commercial Laboratory on Celestialite:

LABORATORY REPORT

SUBJECT
Report on CELESTIALITE and Opal Glass (Best Type of commercial unit glassware)

TO DETERMINE
1. **Relative visual acuity**
2. **Relative Visibility**
3. **Relative Eye Comfort**
4. **Relative Diffusion of Light**

LABORATORY FINDINGS

The sample of Celestialite Glass sent for test transmitted 82 percent as much light as the sample of Opal glass.

Equal visibility of the printed page was, however, obtained with only 80 percent as much light of Celestialite quality as of the quality of the same source (Mazda lamps) transmitted through the Opal glass. Therefore, for the same intensity of source, the Celestialite glass gives slightly higher visibility than the Opal in spite of the fact that there is a higher foot-candle illumination with the Opal glass.

Further, it took only 78-80 percent as much illumination of Celestialite quality as of the Opal just to discriminate a detail of a given size. In addition, the Celestialite glass gives much greater comfort to the eye and much better diffusion of light than the Opal glass.

It would seem, therefore, that the Celestialite glass gives an illumination which is superior to the Opal from the standpoints of visual acuity, visibility, eye comfort, and diffusion of light.

Respectfully submitted,
(By a Non-Commercial, Non-Interested Laboratory)

Two Units from a Varied Line

NO. 11425

9⅜" (100 watt)	13" (200 watt)
11⅜" (150 watt)	16" (300 watt)

Pleasing contour and efficiency combined in Celestialite. This is standard for City of Boston, Mass.

NO. 11984, Lip Type — NO. 11999, Lipless

10" (100 watt)	14" (200 watt)
12" (150 watt)	16" (300 watt)

A modern design, yet simple in lines. Used with safety or set screw fixtures.
Available in Celestialite or Silvaglo.

Celestialite's Three Layers:

THE GOODYEAR TIRE & RUBBER COMPANY, INC.

Akron, Ohio • • Los Angeles, Cal.

In building or remodeling, specify

GOODYEAR RUBBER FLOORING

to gain these 6 lasting advantages

Goodyear Wingfoot Flooring with border strip and mortised design

1. **DURABILITY**—makes a "lifetime" floor that will probably never need replacing.
2. **CLEANLINESS**—impervious to dirt. A damp mop keeps it spotless.
3. **QUIET**—its resiliency assures maximum silence, as well as comfort underfoot.
4. **BEAUTY**—rich two and three tone colors that permanently retain their life and sparkle.
5. **FIRE AND STAIN RESISTANT**—unmarred by lighted cigarettes and matches; not stained by acids, alkalis, ink, etc. Ideal for laboratories.
6. **STYLE**—wide choice of colors and designs, adaptable to any interior plan.

Two Types Available

GOODYEAR RUBBER TILE—laid in individual blocks of specified thickness, size, shape and color—applied piece by piece in any desired pattern.

GOODYEAR WINGFOOT SHEET RUBBER FLOORING—made in continuous lengths like linoleum and laid in the same manner. Appreciably lower in cost than rubber tile, it is the most economical, *permanent* covering for large school-room floors. Available in a wide range of colors with border and feature strips adaptable to more than 100,000 different designs.

For complete specifications, see Sweet's Architectural Catalogue

Typical Goodyear Rubber Tile school floors

GRAYBAR ELECTRIC COMPANY

Executive Offices: Graybar Building, Lexington Ave. and 43rd Street
New York, N. Y.

DISTRIBUTING HOUSES

Akron, Ohio	Davenport, Iowa	Jacksonville, Fla.	Norfolk, Va.	St. Paul, Minn.
Albany, N. Y.	Dayton, Ohio	Kansas City, Mo.	Oakland, Calif.	Salt Lake City, Utah
Asheville, N. C.	Denver, Colo.	Knoxville, Tenn.	Oklahoma City, Okla.	San Antonio, Texas
Atlanta, Ga.	Detroit, Mich.	Los Angeles, Calif.	Omaha, Nebr.	San Francisco, Calif.
Baltimore, Md.	Duluth, Minn.	Louisville, Ky.	Orlando, Fla.	Savannah, Ga.
Beaumont, Texas	Durham, N. C.	Memphis, Tenn.	Philadelphia, Pa.	Seattle, Wash.
Birmingham, Ala.	Flint, Mich.	Miami, Fla.	Phoenix, Ariz.	Spokane, Wash.
Boston, Mass.	Ft. Worth, Texas	Milwaukee, Wis.	Pittsburgh, Pa.	Syracuse, N. Y.
Brooklyn, N. Y.	Fresno, Cal.	Minneapolis, Minn.	Portland, Ore.	Tacoma, Wash.
Buffalo, N. Y.	Grand Rapids, Mich.	Mt. Vernon, N. Y.	Providence, R. I.	Tampa, Fla.
Charlotte, N. C.	Hammond, Ind.	Nashville, Tenn.	Reading, Pa.	Toledo, Ohio
Chicago, Ill.	Harrisburg, Pa.	New Haven, Conn.	Richmond, Va.	Washington, D.C.
Cincinnati, Ohio	Hartford, Conn.	New Orleans, La.	Roanoke, Va.	Wichita, Kan.
Cleveland, Ohio	Houston, Texas	New York, N. Y.	Rochester, N. Y.	Winston-Salem, N. C.
Columbus, Ohio	Indianapolis, Ind.	Newark, N. J.	St. Louis, Mo.	Worcester, Mass.
Dallas, Texas				Youngstown, Ohio

PRODUCTS

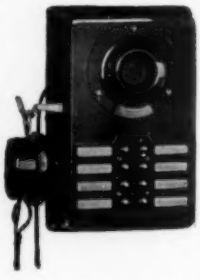
The Graybar Electric Company brings to meet any and every electrical need for schools and colleges more than 60,000 electrical supplies—supplies whose dependability is warranted by Graybar's 67 year old quality reputation.

The 77 distributing houses listed above bring these supplies within arm's reach of demand everywhere, making instantly available everything electrical, to transmit, apply and control electricity in school and college buildings.

INTER-COMMUNICATION

School boards, superintendents, and architects can well appreciate the importance of an interior telephone system that knits all the individuals of the teaching staff together—without, at the same time, requiring the services of an operator. Graybar Inter-Phones are simple to operate. The user merely pushes a button to make a connection.

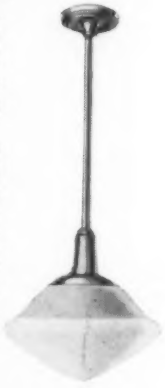
In addition, Graybar supplies many other types of electrical signalling equipment for schools, including bells, buzzers, annunciators, and gongs of every variety with all accessory equipment. Write us for more detailed information.



PROGRAM AND SOUND SYSTEMS

We can now supply complete school systems covering Telephone Communication, Fire Alarm, Program Clocks, Laboratory Switchboard and Panels, Complete Public Address or the Program Sound System which is a two channel type arranged to provide pick up from microphones, phonograph reproducers or an all way radio receiver on either channel and will provide two programs simultaneously. It is possible to select any one of the pickups, amplify it and distribute the program to any one or all the speakers in the class rooms at the same time.

LIGHTING EQUIPMENT



A complete selection of fixtures, glassware and accessory products to meet the specialized needs of school and college buildings is easily available through Graybar.

Lighting specialists from Graybar can help architects and school boards secure the most efficient installation. The Graybar Electric Company has given the problem of proper school lighting special study and has developed a line of lighting fixtures and glassware well suited to school and college needs.

LAMPS

Mazda Lamps are available on quick call at Graybar Electric Company distributing houses located in 77 principal cities throughout the country.

These well-known, extremely efficient lamps are stocked in the five standard sizes—25, 40, 60, 100 and 200 watts—adopted to simplify ordering.

WIRING SUPPLIES

Graybar Electric Company distributing houses carry large stocks of wiring supplies for power, light and inter-communication construction and maintenance. This includes wire, conduit, wiring devices, conductors, etc., for all purposes. All materials are of the highest quality, the products of long established, well-known manufacturers.

60,000 OTHER ITEMS

The above products cover only a very small portion of the 60,000 products distributed by Graybar. For complete information covering these or other electrical products for schools and colleges address the nearest Graybar office, or Graybar Electric Company, Lexington Ave. and 43rd St., New York, N. Y.

W. F. HIRSCHMAN CO., INC.

Main Office: Buffalo, N. Y. — Works: Le Roy, N. Y.

New York, N. Y., 202 East 44th St. — Boston, Mass., 143 Federal St.

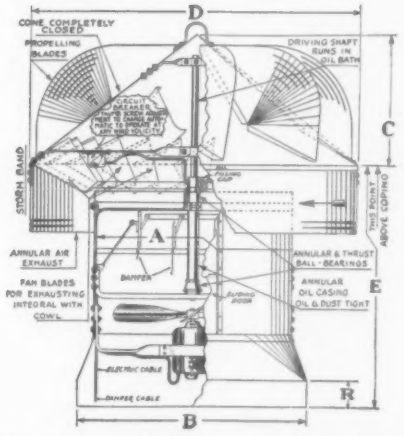
Manufacturers Roof Ventilators and Electric Controls

Principle of Operation of Wind-Electric Ventilator Full Automatic—When the wind is blowing sufficiently to remove the desired amount of air from the building being ventilated, the electric motor is still. Instantly, when the wind turbine moves below a previously determined number of revolutions, the electric motor starts automatically and carries the load. The entire apparatus is noiseless.

Special Advantages—Beside the regular automatic operation the motor may also be so connected as to give a maximum exhaust capacity (running full speed) by manual control.

The Effico Wind-Electric Ventilator, Full Automatic—Recommended for those installations which require a definite minimum exhaust at all times or which may require an unusually heavy exhaust at intermittent periods.

This apparatus is adjustable to exhaust various quantities of air within the limits of given sizes and is regularly supplied at capacities of 5 miles per hour wind and 10 deg. temperature difference rating. **The Wind-Electric will exhaust minimum volume regardless of temperature difference or wind velocity.** Other capacity can be supplied and the ventilator is adjustable to any constant capacity after installation.



Pat. May 20, 1922; March 20, 1928; August 21, 1928.
Detail of Effico Wind-Electric Rotary Ball Bearing Ventilator Full Automatic

Note.—Details of Wind Driven (only) Ventilator are Identical with Exception of Motor Unit.

DIMENSIONS AND CAPACITIES OF EFFICO WIND-ELECTRIC AND WIND DRIVEN VENTILATORS

Nominal Ventilators Sizes in Inches	Dimensions in Inches (See Diagram) A-Actual Size of WE Ventilator	B—Base	C—Height of Blades	D—Diam. of Storm Band	E—Height of Band	Thickness of Metal Gage G.I. Cowl	Gage G.I. Base	Oz. Copper Cowl	Oz. Copper Base	Motor H.P.	Cubic feet of air exhausted per minute at 0-5 miles per hour wind velocity. Temperature difference in degrees Fahr. between air in building and outside air 0°-10°	10°-20°	20°-30°
12	14	20	8	21¾	32	24	22	14	16	1/30	440	515	560
18	19	26	10	28½	32	24	22	16	18	1/30	850	950	1040
24	25	38	14	40	35	24	20	16	18	1/30	1600	1780	1900
30	31	40	14	50	37	24	20	18	20	1.6	2300	2690	2900
36	37	44	18	60	40	22	18	18	24	1.6	3400	3810	4100
42	43	50	22	68	46	22	18	20	24	1.6	4500	5010	5500
48	49	56	24	76	46	22	18	20	24	¼	5900	6700	7400
54	55	62	24	86	46	22	18	24	24	¼	7300	8450	9500
60	60	66	24	98	50	22	18	24	24	½	9300	10600	11900
72	72	80	30	114	50	20	16	24	24	½	13500	14600	16000
84	84	92	40	130	50	20	16	24	32	1	18000	21000	23000
96	96	116	45	153	50	20	16	24	32	1	22500	27000	29000

R dimension—5 in. on all sizes.
C dimensions should be above coping.

Hirschman Electric Damper and Motor Controls

Manual, Thermostat or Humidistat Remote Control

The Hirschman Electric Control — Will operate any type of damper, round, square, rectangular, or multi-blade in either vertical or horizontal position, will also control motor, louvers, etc., in any part of the building.

This control is absolutely positive and holds the subject rigid in desired position and also makes it possible to so co-ordinate that fan motor cannot be operated when dampers are closed.

Effico Rotary Ball Bearing Ventilator Installation, Wind Driven (only). The Effico Wind Electric Also Has the Same Artistic Lines and Pleasing Appearance. Lowest in Height of Rotary Ventilators by Over 50 per cent Average

"EFFICO" WIND-DRIVEN ROOF VENTILATORS

The Effico Ventilator consists of a wind-driven head to which suction blades are permanently connected (on the underside) making an efficient exhaust fan. Rotation of the head creates an exhaust suction in the throat of the ventilator. There are no moving parts.

OUR APPARATUS IS ESPECIALLY APPLICABLE FOR SCHOOLS. HUNDREDS OF SCHOOLS ARE VENTILATED BY OUR VENTILATORS

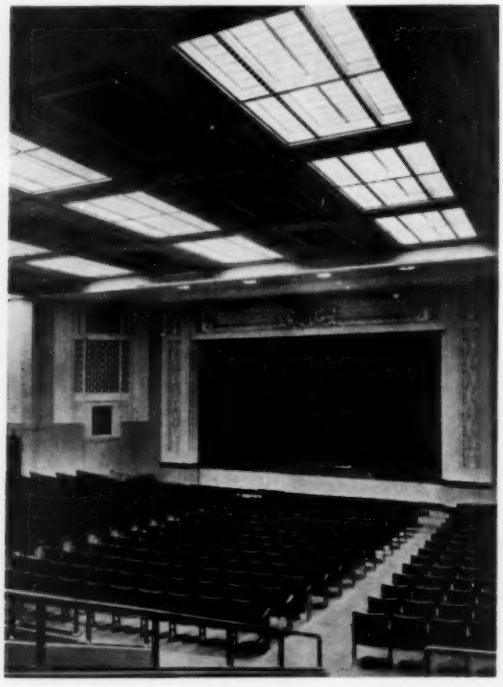
THE AMERICAN SCHOOL AND UNIVERSITY

HOLOPHANE COMPANY, INC.

342 Madison Avenue, New York

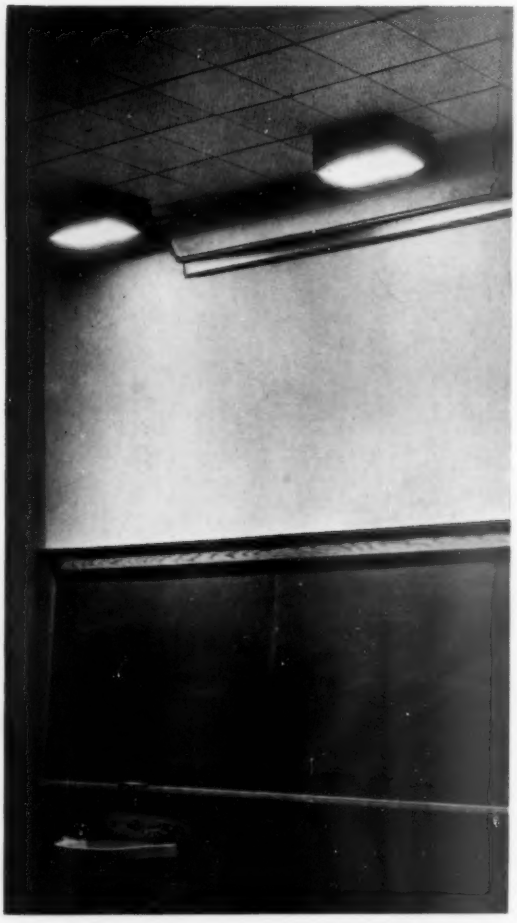
WORKS at Newark, Ohio

***Lighting* FORESIGHT *That Guards Students'* EYESIGHT**



An Auditorium in the Rufus King High School

● **HOLOPHANE is Lighting the Way to Higher I.Q.'s Through Keener Vision . . .**



● Holophane lighting installations not only befriend your students' vision, but also your lighting budget.

● At lowest cost, Holophane special units provide maximum efficiency for each school lighting need—indoors and out.

● The Holophane engineering staff is at your service. Investigate, without obligation.

A Classroom Blackboard in the University of Minnesota . . .

JOHNS-MANVILLE

22 East 40th Street, New York, N. Y.

Offices in all large cities

J-M Sound Control

There are three classes of sound control for schools and universities. The first requirement is that of auditoriums and large class rooms where it is desirable to have the words of speaker or teacher distinctly audible in every seat; or where music may be presented without causing disturbing echoes or excessive reverberation.

The second class of correction is required for reducing noise to an undisturbing level in halls, corridors, study halls, gymnasiums, swimming pools, restaurants and kitchens. Science has proved by conclusive tests the advantages of quiet for study and, conversely, the injurious effect on the nervous system that results from constant exposure to noisy surroundings.

The third class of correction consists in the isolation of sound at its source, which permits the installation of mechanical equipment at advantageous locations, without causing disturbance in other parts of the building.

J-M ACOUSTICAL TREATMENT APPLIED TO THE ASSEMBLY HALL OF JOHN HAY HIGH SCHOOL, CLEVELAND, OHIO

There is a wide range of J-M sound control materials adaptable to any need. They can be applied over any existing or new surfaces and lend themselves readily to any desired decorative scheme. For complete information, address the Acoustical Division of Johns-Manville, whose engineers are pleased to advise on sound control in existing or proposed school or college structures.

J-M Bonded Built-Up Roofs

The construction of most school and college buildings is admirably suited to take advantage of the protection afforded by a J-M Bonded Built-Up Roof. There are more than 40 types of J-M Roofs from which to select the most desirable for existing conditions.

THE TILDEN HIGH SCHOOL, BROOKLYN, PROTECTED BY A J-M BUILT-UP ROOF

With the installation of a J-M Built-Up Roof all concern about leaks, fire and upkeep is removed for a specified term of years. Depending on the grade of roof selected, a bond backed by Johns-Manville and the National Surety Company will be issued—for 10, 15, or 20 years.

J-M Asphalt Tile Floorings

Johns-Manville Asphalt Tile Flooring, Type A, is a resilient, quiet, decorative floor covering produced in tile units of various sizes and colors, applicable over practically any sub-floor which is smooth and firm. The tiles are long-wearing, comfortable, stain-proof, fire-resistant, of pleasing appearance and low in cost.

J-M Heavy Duty Asphalt Tile is a new type of flooring especially designed for severe service such as that encountered in school corridors, halls, lobbies, etc. Though resilient, it is strong and virtually abuse-proof. It may be installed below grade where damp conditions prevail and can also be applied directly to smooth wood subfloors, without the usual leveling course.

For details and color charts write for the brochure, "Modern Flooring with Asphalt Tile."

JOHNS-MANVILLE JM PRODUCT

KAUSTINE COMPANY INC.

Engineers and Manufacturers of Sewage Disposal Equipment

Perry, N. Y.

PRODUCTS

Kaustine Septic Toilets, the modern sanitary indoor toilet system for the healthy rural school; and

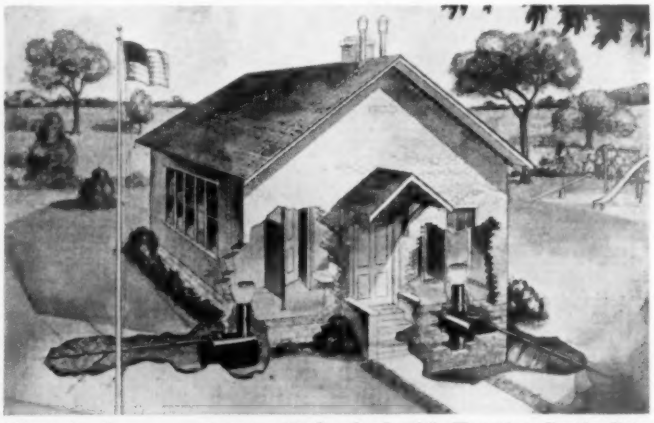
Kaustine Septic Tanks, vertical type, for homes, schools and institutions, and horizontal type, for use in schools where larger capacities are required.

Kaustine Septic Tanks and Toilet Systems are completely constructed ready for installation. It is not necessary to do any construction work on the ground where they are to be installed. Simply make the excavation, place the tank in the hole and cover it with earth.

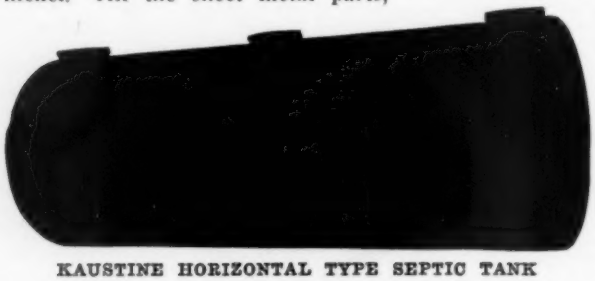
KAUSTINE SEPTIC TOILETS

In rural schools all over the country, a necessary evil in the past was the old-fashioned outdoor toilet with its inconvenience, its inaccessibility, its exposure to cold, illness and disease. It is no longer necessary today. From every standpoint, it is a menace. In selecting modern equipment to replace the nuisance of improper sewage disposal, it is dangerous to employ guesswork. The problem is one for a competent engineer—who will study ground structure, moisture content, climatic conditions, rock strata and soil composition, and devise a sanitary indoor toilet system made to suit your school's exact needs.

The Kaustine Septic Toilet has all the advantages of flush toilets without requiring a supply of running water. Each part is designed to furnish long, continuous service. The bowl of vitreous china has a smooth, form-fitting seat hinged with bright nickel. All the sheet metal parts, including the tank below, are of Armco ingot iron, the most durable of all metals for this purpose. The cost is surprisingly low. No chemical is needed for its operation.



Above is shown a one-room rural school with Kaustine Septic Toilets installed. The system on the left side has the manhole outside the building; the system on the right side has the tank entirely within the basement



KAUSTINE HORIZONTAL TYPE SEPTIC TANK

KAUSTINE SEPTIC TANKS

For schools where running water is available, but sewer connections are lacking, the Kaustine Septic Tank is the solution. Made entirely of Armco Ingot Iron, with its well-known high rust-resisting qualities, the Kaustine Septic Tank is available in two types—the vertical tank, for homes and small institutions, and the horizontal tank (illustrated at left) adapted for use where larger capacities are required.

As an additional protection against corrosion, the Kaustine Septic Tank is coated inside and outside with plastic enamel. Another Kaustine feature is the removable top, or in the larger tanks, the manhole covers, held in place by brass nuts, insuring easy and speedy access to the interior.

E-Z DRAIN TILE CONNECTOR—STYLE NO. 2

E-Z DRAIN TILE CONNECTORS

Here is another Kaustine product of value to schools—used for permanent, trouble-free installation of absorption bed tile, for draining lawns, athletic fields, etc.

Write for illustrated circulars

KERNER INCINERATOR COMPANY

3701 North Richards Street, Milwaukee, Wisconsin

OFFICES AND AGENCIES IN OVER 150 CITIES

PRODUCTS

KERNERATORS: For the prompt, safe, and sanitary disposal of all kinds of rubbish (including garbage) by incineration. Manufactured in four types:

Flue-fed
Basement-fed
Estate (downdraft)
Gas-fired ("Commercal")

Of the first three types, there are sizes and layouts to fit the need of large and small schools, both public and private, and for college and university dormitories, in either existing or contemplated buildings.

Importance of the Kernerator for All Types of School Buildings

It is the constant purpose of school board members, school superintendents, architects, builders and all those responsible for school design and construction to make certain that equipment is provided that will promote safety and sanitation in school buildings.

Kernerator Commercial Expressly designed for School Cafeterias

Safety

There are probably no buildings in which the immediate and sanitary disposal of waste is as important as in schools. Statistics show a large percentage of fires are due to accumulations of loose waste paper and rubbish in school basements. Bailing paper is a doubtful economy.

Sanitation and Hygiene

The KERNERATOR provides a convenient, sanitary and economical method for handling all sweepings, lunch remains, garbage from the cafeteria (if there is one) and all promiscuous waste.

There is no denying the fact that the sanitary waste from girls' washrooms is a constant source of maintenance expense for the cleaning out of clogged drains and damage from flooded toilets. This occurs in spite of receptacles placed in the washrooms.

Flues may be so located that one set of hopper doors will open into the girls' washrooms. This idea has been adopted by a number of architects (names upon request) with very satisfactory results in actual operation.

Economy

The KERNERATOR eliminates the expense of labor, time and equipment in handling, storing and transporting rubbish and garbage; the necessity of daily collections of waste paper and sweepings—frequent trucking. It also cuts the cost of plumbing repairs due to drains stopped by sanitary waste in girls' washrooms.

The Kernerator Commercial

This incinerator was developed for the sole purpose of disposing of garbage from cafeterias and restaurants.

It is easily installed, covers a floor space of only 39″ x 28″, is exceedingly economical to operate and costs considerably less than the bricked-in type.

It uses gas or coal, and will handle the garbage from the largest cafeterias or restaurants.

Service

The KERNERATOR is made and sold by the pioneer in the flue-fed incineration field. Satisfactory operation is guaranteed by a financially sound organization having a stable, trained corps of incinerator experts with a wide experience in school installations.

Further Information

When you are making plans for a school building, may we send a specialist to discuss your waste disposal problems? He will be glad to recommend the proper type and size of equipment depending upon the number of rooms, number of pupils, and the height of the building.

Literature

Send for the new pamphlet "The School Incinerator" giving full information and a list of KERNERATOR installations in over 300 schools.

THE LANDIS PROGRAM CLOCK CO.

GRAYBAR ELECTRIC CO., DISTRIBUTORS

Waynesboro, Pa.

LANDIS PRODUCTS FOR SCHOOL AND COLLEGE USE

The Landis System includes a complete line of high-grade Master Clocks, Secondary Clocks, Program Machines, Control Panels, Program Bell Push Button Boards and Special Time Control Apparatus. Its completeness and flexibility enables the school architect to select equipment to meet the most exacting requirements for either large or small school.

All Program Bells, Buzzers, Horns, etc., also Fire Alarm and Telephone Systems furnished with Landis equipment are of the highest quality.

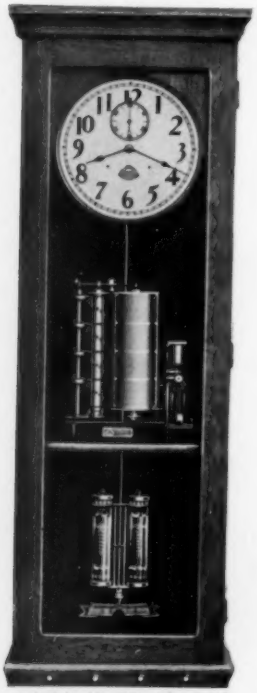
Landis also manufactures a complete line of Laboratory Voltage Distribution Control Panels, Instructors' Panels, Student Table Outlets, etc., for use in science laboratories.

TYPE OF SYSTEM

The Landis System is the minute impulse automatic hourly synchronized type of electric time system whereby any number of secondary clocks and automatic program machines for indicating and signaling time can be operated by minute impulses from the master clock. The automatic hourly synchronized control is arranged to automatically check the program machine and each secondary clock hourly and, if necessary, reset same to the correct time of the master clock if ever disturbed due to current interruptions or other outside irregularities.

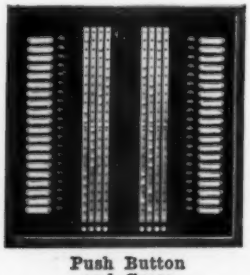
This type of system is by far the most rugged, simple and economical, and is greatly preferred where there is a necessity for group controlling of clocks. It results in uniform time and signals, making possible coordinated action and efficiency.

Write for illustrated booklet, "Landis Electric Time and Program Clock Systems," or consult the nearest Graybar distributor



Combined Master and Program Clock 1-Minute Type Program Machine

Style 2M Round Metal Secondary Clock



Push Button and Cross Connecting Board

Style 3S Square Wood Secondary Clock

Secondary clocks made in a wide range of styles and size, also double dial clocks, and ornamental marble and skeleton dial clocks.

Distributed and guaranteed by Graybar Electric Company

OFFICES IN 74 PRINCIPAL CITIES

LEVERING BROTHERS, INC.

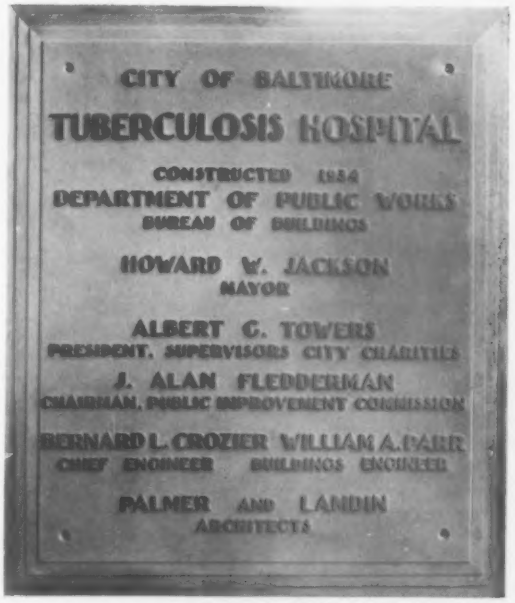
200 Key Highway
Baltimore, Md.

BRONZE FOR SCHOOL TABLETS, HONOR ROLLS, MEMORIALS

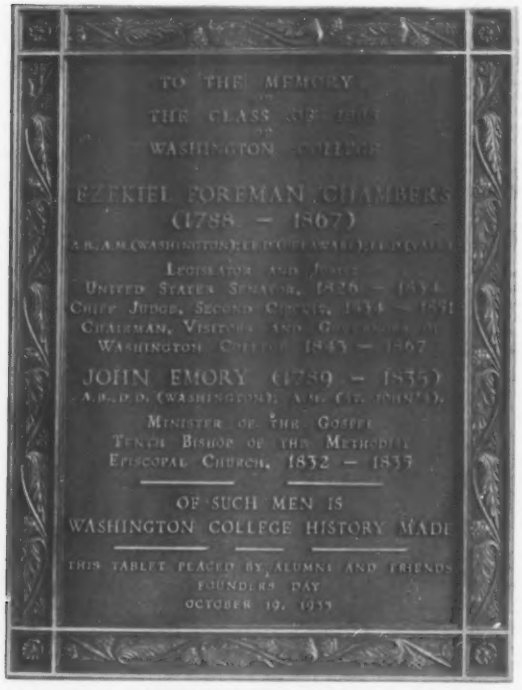
Practically every school has occasion, at some time, to commemorate an important event in its history, or to do honor to a notable teacher or principal or superintendent or pupil or school founder or benefactor; and the question arises as to what type of memorial will be most fitting, beautiful and lasting. The Bronze Tablet, or Honor Roll, or Medal, comes to mind immediately as a completely satisfactory answer to this need.

Levering Brothers, Inc., of Baltimore, Md., will be glad to have schools consult with them in connection with their choice of a suitable memorial of bronze, and will submit special or standard designs to fit any requirement.

Contrary to general belief, the cost of bronze is not extravagant when measured with the life of the object. A Bronze Tablet lasts practically forever, and actually improves with age, growing more beautiful as time goes on. Bronze work by Levering Brothers, Inc., from the simplest signplate to the intricate piece of statuary cast in the round, is of unsurpassed beauty of design and craftsmanship.



ORNAMENTAL CAST ALUMINUM TABLET, 24" x 30". ERECTED BY CITY OF BALTIMORE, 1935
Special "Waylet" type of lettering



18" x 24" BRONZE TABLET, ERECTED AT WASHINGTON COLLEGE, CHESTERTOWN, MD.
Unveiled October 19, 1935, Founders Day

ALUMINUM—ANOTHER BEAUTIFUL AND LASTING MATERIAL FOR SCHOOL MEMORIALS AND TABLETS

Although Aluminum Castings have not long been in use in the design and composition of memorials, tablets and wall placques, both the beauty of Aluminum and its long life make it a perfect metal for the purpose — and no more expensive than Bronze, when you consider its lighter weight.

Your inquiries on either Bronze or Aluminum are solicited. Sketches, suggestions and prices will be sent on request.

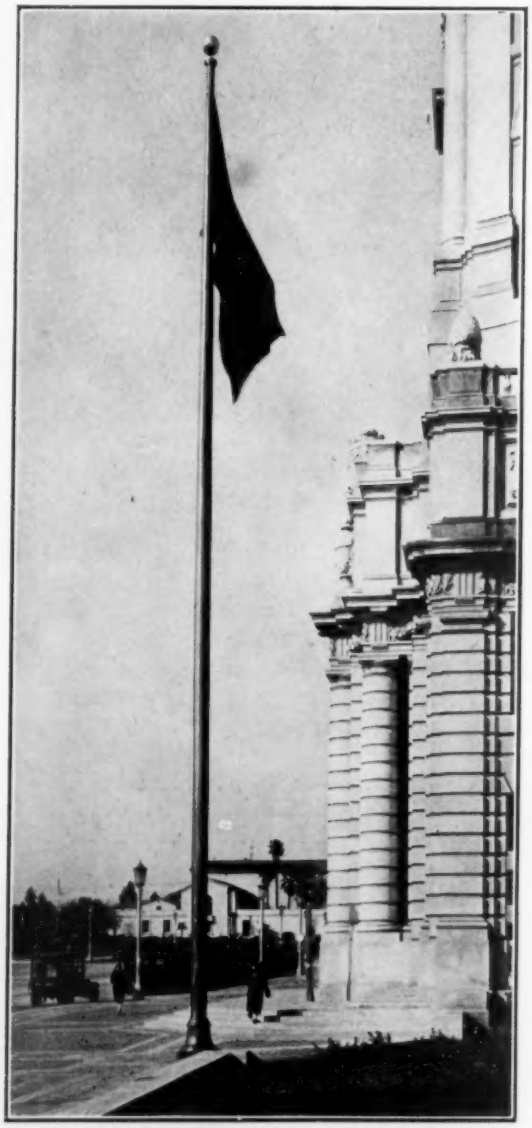
Established 1897

JOHN E. LINGO & SON, INC.

Manufacturers of

Flagpoles in Copper Bearing Steel, Bronze and Aluminum

29th Street & Buren Avenue, Camden, N. J.



72-FT. OVERALL CONTINUOUS ENTASIS TAPERED COPPER-BEARING STEEL FLAGPOLE

12¾-in. butt x 5-in. top. One of two installations at Civic Center, Pasadena, Calif.

FOUR DISTINCT TYPES OF FLAGPOLES

Continuous Straight Tapered Flagpoles are made of steel in one piece in lengths from 20 feet to 100 feet and are tapered conically with a smooth uninterrupted exterior surface throughout without visible points or offsets. These poles are standardized and carried in stock for immediate shipment, and are sold in the same price range as the extra heavy swaged sectional poles.

Continuous Entasis Tapered Flagpoles are made of copper-bearing steel, bronze or aluminum in one piece in lengths from 12 feet to 100 feet and are tapered with Venetian entasis, having a smooth uninterrupted exterior surface throughout without visible joints or offsets. These poles are specially designed for memorials, monuments and buildings of exceptional architectural value. They are standardized but not carried in stock, being made to order only.

Swaged Sectional Flagpoles are fabricated in sections of copper-bearing steel pipe and standardized in lengths from 17 feet to 150 feet. Shop joints and field joints are made without the use of bolts, pins, rivets, screw couplings or lead calking. These poles are shipped in knocked-down sections with easy assembly at erection site, no tools other than an ordinary hammer and calking chisel being necessary to accomplish this work.

Equipoise Tilting Flagpoles are Swaged Sectional or Continuous Entasis Tapered steel poles in lengths from 20 feet to 40 feet, equipped with a counterbalanced arrangement which allows the pole to be lowered for repainting or installing halyards.

CATALOGS AND SERVICE

Catalog and pamphlets giving full information, details and specifications, etc., will be gladly mailed on request.

Our Engineering Department will gladly assist you in planning your contemplated flagpole installations most satisfactorily and economically without obligation whatsoever.

MAPLE FLOORING MANUFACTURERS ASSOCIATION

332 South Michigan Avenue, Chicago, Ill.

Floor *with* Maple

IN CLASS ROOMS, ASSEMBLY HALLS, SHOPS AND GYMNASIUMS

PRODUCTS

MFMA trademarked Northern Hard Maple, Beech and Birch Floorings, standardized and guaranteed as to grade and manufacture.

QUALITIES

Northern Hard Maple—a tight grained, hard fibered wood—has the school-room floor essential qualities of long wear, smoothness, cleanliness and foot comfort. Economical in installation and maintenance cost. Provides firm anchorage for desks, facilitates alterations.

GOOD SERVICE FINISHES

Service finishes that seal the surface of Hard Maple, keep out dirt, resist soil stains, prove non-slippery—now available. Will not mar, scratch or flake off. Easy to clean and economical to maintain.

PATTERNS

You can lay Maple in strips or blocks—with or without pattern—over screeds, wood or concrete sub-floors.

GRADING RULES

MFMA Northern Hard Maple, Beech and Birch Floorings are kiln-dried, sold in standard grades, described in detail in a book of Grading Rules, available on application.

Standard lengths, 25/32 inch and thicker strip flooring as follows:

MFMA First Grade: 2 to 16 feet, may contain up to 25% of 2 to 3½ feet, inclusive.

MFMA Second Grade: 1½ to 16 feet, may contain up to 40% of 1½ to 3½ feet, inclusive.

MFMA Third Grade: 1 to 16 feet, may contain up to 60% of 1 to 3½ feet, inclusive.

THICKNESSES AND FACES

Popular sizes of Hard Maple strip flooring are 25/32", 33/32" and 41/32" thicknesses in the 1½" (25/32" only), 2", 2¼" and 3¼" face widths.

Hard Maple block flooring, cut to exact, uniform lengths, in 25/32" and 33/32" thicknesses is available in individual blocks and in fabricated squares or rectangles.

Hard Maple Floor in Foster School, Evanston, Illinois. 35 years old, reconditioned with Heavy-Duty finish—floor previously scrubbed—no treatment

Laying Hard Maple Block Flooring in the University of Minnesota Indoor Sports Building

Let our Service and Research Department assist you with your flooring problems. Write us

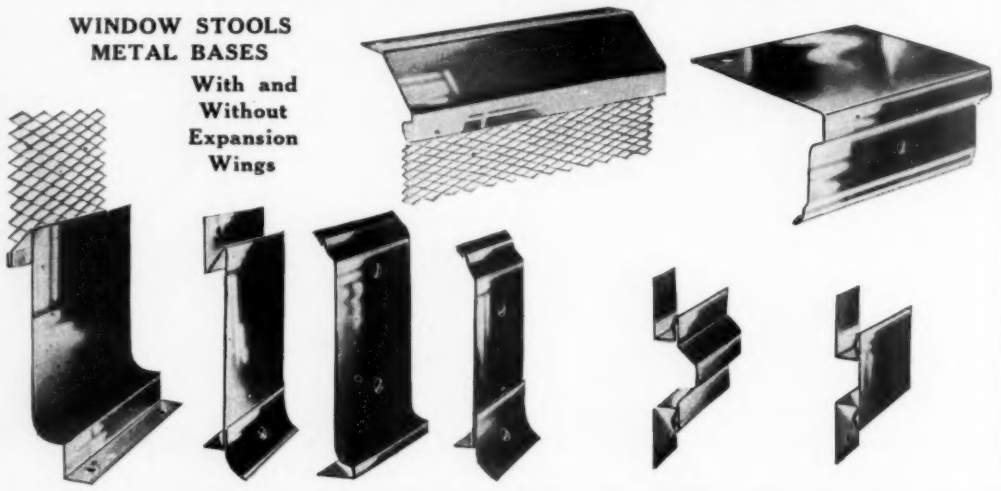
THE AMERICAN SCHOOL AND UNIVERSITY

MILCOR STEEL COMPANY

Milwaukee, Wis.
Chicago, Ill.
Kansas City, Mo.
Canton, Ohio
La Crosse, Wis.

METAL TRIM *and* FIREPROOF BUILDING MATERIALS

WINDOW STOOLS
METAL BASES
With and Without Expansion Wings



The Finest and Most Complete Line of Metal Trim Available

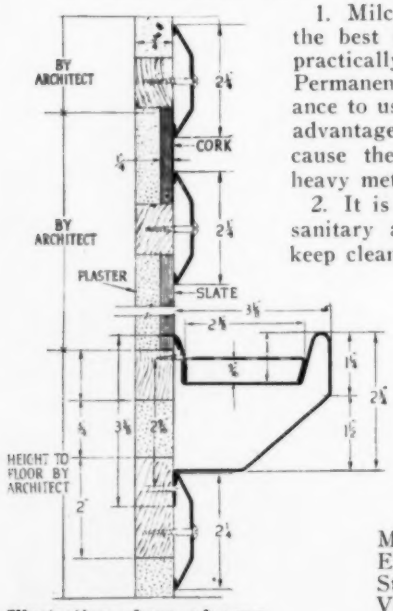


Illustration above shows cross section view of No. 734 Chalk Trough. In the new catalog complete dimensions, and working drawings are given for every type of Milcor Metal Trim

1. Milcor Metal Trim provides the best possible construction for practically all kinds of buildings. Permanence, fire safety, and resistance to use and abuse are inherent advantages in these products because they are made entirely of heavy metal.

2. It is attractive in appearance, sanitary and economical, easy to keep clean and to maintain.

3. The line is COMPLETE. Every desirable type of metal window trim and stool may be found in the Milcor line and numerous different installations may be achieved by combining various designs, mouldings and bases.

4. Cast iron fittings are WELDED to the stools and trim at the factory, an important, exclusive feature which makes these products unequalled in strength, appearance and ease of installation.

THE METAL TRIM LINE INCLUDES

Window Trim and Stools, Flush and Removable Metal Bases, Mouldings, Door and Window Casings, Chair Rails, Base Screeds, Picture Moulds, Chalk Troughs, Corner Beads, Expansion Cornice Lath, Basement Windows, Metal Access Doors.

Send for new Catalog No. 100-B—Specification Manual

OTHER MILCOR PRODUCTS

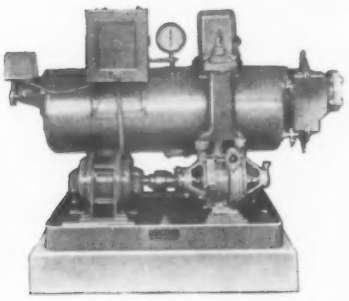
Metal Lath
Expansion Corner Bead
Steel Roof Deck
Ventilators
Skylights
Steel Ceilings
Spanish Metal Tile
Heating Materials
Rain Carrying Equipment

MILCOR (Copper Alloy Steel) **PRODUCTS**
Save with Steel

THE NASH ENGINEERING COMPANY

South Norwalk, Conn., U. S. A.

SALES AND SERVICE OFFICES IN ALL PRINCIPAL CITIES

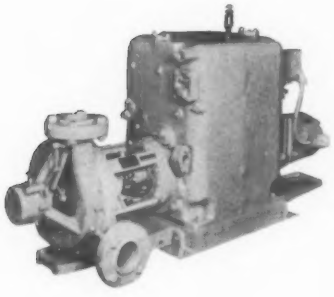


Jennings Return Line Vacuum Heating Pumps

Standard with the heating industry for over sixteen years. They remove air and condensation from the return lines of vacuum steam heating systems, discharging the air to atmosphere and returning the water to the boiler.

Two independent units are combined in a single casing—an air unit and a water unit. Impellers of both are mounted on the same shaft. The pump is bronze fitted throughout.

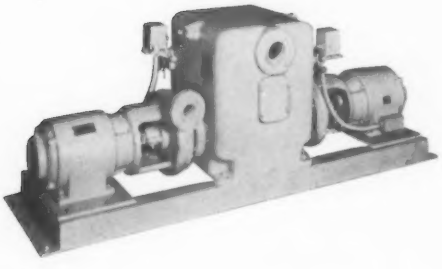
Supplied either direct connected to standard electric motors, for belt drive, or for steam turbine drive. For continuous or automatic operation against pressures up to 40 lbs. Supplied standard in capacities up to 300,000 sq. ft. E.D.R.



Jennings Vapor Turbine Vacuum Heating Pumps

The Jennings Vapor Turbine Heating Pump combines all of the advantages of the standard return line heating pumps with a new type of drive, a specially designed low pressure turbine which operates directly on steam from the heating mains on any system, requiring a differential of only 5 in. of mercury, and returns that steam to the heating system with practically no heat loss.

This pump affords the safety and economy which goes with a continuous condensation return and steady vacuum, and at no cost for electric current. Furnished standard in capacities up to 65,000 sq. ft. E.D.R. Over 65,000 sq. ft. and up to 150,000 sq. ft. Information on request.

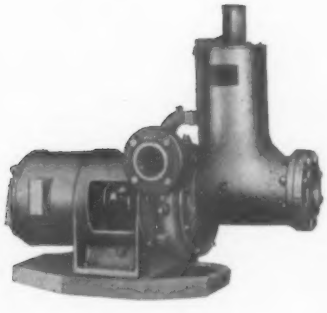


Condensation Pump and Receiver

Removes condensation from radiators in return line steam heating systems and pumps condensation back to the boiler.

They are sturdy and compact in construction, and combine receiving tank, pump and driving motor in a single assembly. Bronze fitted throughout, with Tobin bronze shaft. Impeller is of special design adapted to handling hot water with highest efficiency.

Jennings Condensation Pumps are furnished in standard sizes with capacities ranging from 1½ to 225 g.p.m. of water, for serving from 1,000 to 150,000 sq. ft. equivalent direct radiation.



Jennings Sump and Sewage Pumps and Sewage Ejectors

The Jennings Suction Sump Pump is a self-priming centrifugal pump for handling seepage water and liquids reasonably free from solids. The Suction Sewage Pump is fitted with a non-clog type impeller. Pumps are mounted entirely above the sump where they are always readily accessible. Only the suction pipe is submerged.

There are two moving parts: the centrifugal impeller and the vacuum priming pump rotor. Both rotate without metal-to-metal contact in the casing.

Capacities and heads to meet all requirements.

NATIONAL WOOD PRODUCTS CO.

Union Guardian Building
Detroit, Michigan

Manufacturers and Installers of

EVANITE—LAMINITE and EVERLEVEL Wood Block Flooring

EVANITE

EVANITE Wood Floor Tile is particularly recommended for the floors of classrooms, science rooms, lecture halls, libraries, auditoriums, etc., wherever it is desired to combine attractive appearance with long lived service under constant traffic.

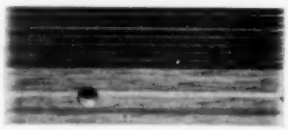
Laid directly on concrete subfloors in Cushionite Mastic, which retains its elasticity indefinitely yet tenaciously secures the flooring to the base, EVANITE Wood Floor Tile is QUIET, SANITARY and Fire Resistant.

Specially milled from thoroughly air and kiln dried selected flat grain stock (not standard strip flooring stock) EVANITE consists of accurately machined strips joined with a special waterproof casein glue and two hardwood dowels inserted entirely through each block, at right angles to the grain of the wood.

An unusual feature of EVANITE installations is a highly efficient spring expansion joint providing most complete protection against expansion and contraction in wood block floors.

LAMINITE

LAMINITE Fir Plywood Flooring is a unique flooring composed of alternate strips of end and edge grain laminations put together with waterproof glue, tongued and grooved and bored for lateral nailing, resulting in a flooring that positively will not cup.



Manufactured from the largest and finest Douglas Fir logs, it has all the advantages of ordinary end grain flooring with the additional advantage of structural strength combined with fine appearance.

LAMINITE may be used in all parts of a school or college, but it is best adapted to those places subjected to heavy duty, such as gymnasiums, stages, auditoriums and manual training rooms.

Manufactured in eight foot strips and in thicknesses from 1 1/16" to 3 1/2" LAMINITE flooring may be laid in any manner in which other types of flooring are laid. It may be applied in mastic directly on concrete subfloors, on sleepers, or nailed to wooden subfloors.

EVERLEVEL
End Grain Strip Wood Block Flooring

Applied in Cushionite Mastic directly on concrete subfloors, EVERLEVEL is an ideal floor for shops, receiving rooms and other places requiring the remarkably durable wearing surface of end grain wood combined with an insulating effect which reduces shop noises.

EVERLEVEL is made from selected yellow pine in 2" or 2½" thicknesses. The individual end grain blocks are assembled into strips up to 8 feet in length by means of full length dowels. The strips are then completely secured into a single unit by tight fitting galvanized steel splines laid in continuous strips the entire length or width of the floor.

The Genuine

Norton Door Closer

is manufactured by the

NORTON DOOR CLOSER COMPANY

Division of The Yale & Towne Mfg. Co.

2900 North Western Ave., Chicago, Illinois

From coast to coast, schools of all types are using Norton Door Closers because of finer workmanship, design and better materials and the Norton "follow through" service. Every Norton Door Closer is inspected after installation by Norton representatives to insure maximum efficiency.

The rack and pinion principle used in Norton Door Closers controls the door during the entire closing swing. It greatly reduces the strain on the closers, the door and the hinges.

A noteworthy indication of excellence is in the fact that all interior moving parts are made of steel, carefully cut and ground from solid steel bars. This gives great strength and longer life. The springs are made of special analysis steel which is unusually flexible and powerful.

Exacting precision exists throughout the Norton factory operation. Every part is carefully inspected to see that each dimension is correct and that there are no flaws in material.

Close attention is given assembly operation. The complete closer is tested to make sure it will perform properly on your door.

The reason for such general school preference for Norton Door Closer lies in the many extra advantages and the "follow through" service which is given at no extra cost.

Send for our catalog.

The specially designed packing nut insures perfect lubrication. Liquid cannot creep up into the spring chamber because capillary attraction is broken in the middle of the packing nut. Note illustration.

WILLIAM R. PITT COMPOSITE IRON WORKS

548 West 27th Street, New York, N. Y.

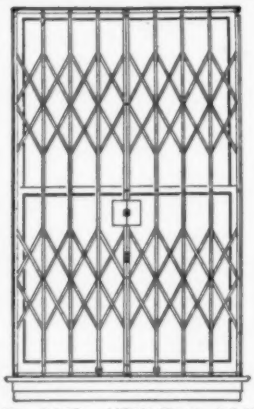
Telephone: CHickering 4–6560

PRODUCTS

"Pitt-Bostwick" and "Pitt" Lazy Tong Folding Gates and Guards of Steel, Bronze, etc.

WHERE USED

These Folding Gates are used in both public school and college corridors and vestibules, entrances to gymnasiums and auditoriums, etc.,—wherever it is necessary or desirable to keep any room, building or section of a building under temporary lock-and-key. They are particularly helpful for keeping within bounds any "outsiders" who may be in attendance at special school functions such as evening entertainments or lectures, or special gymnasium programs. "Pitt-Bostwick" Window Guards, too, are valuable for protecting windows from accident or tampering.



No. 1267—"Pitt-Bostwick" Guard for Window, with Stationary Top and Bottom Tracks
Can be arranged to fold and swing

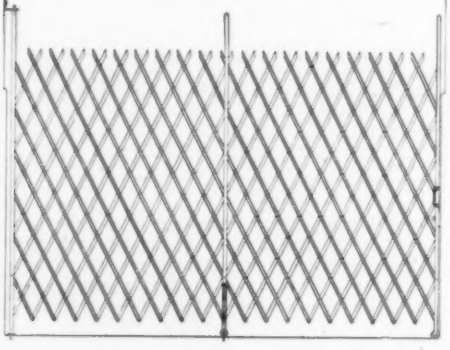
QUALITY

Every Pitt product is of the highest grade workmanship and material—strong, durable, easily operated. This company is the original manufacturer of the "Bostwick" gate and the originator of most of the standard folding gates. By training, experience and facilities, we are prepared to meet the demands of any school architect or builder with a thoroughly satisfactory, dependable product.

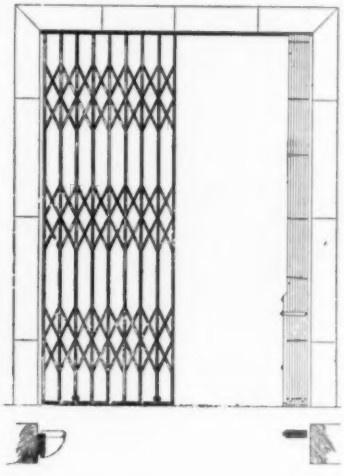
FOLDING GATE ESTIMATES

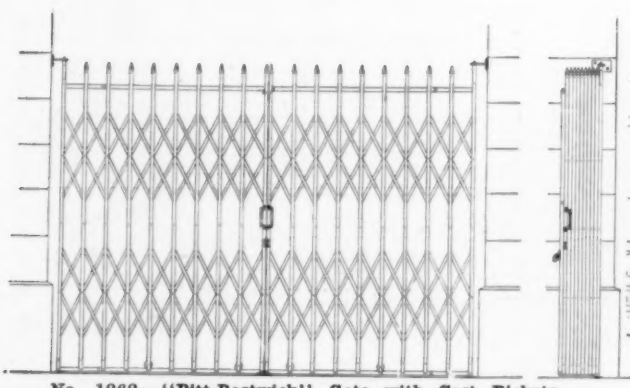
School architects or executives are invited to submit their plans and specifications to us for an estimate. State purpose for which the gate or guard is intended, required width and height, and where it is to be set.

No. 1303-D—"Pitt" Lazy Tong Gate with Pointed Tops
Also made with rounded tops

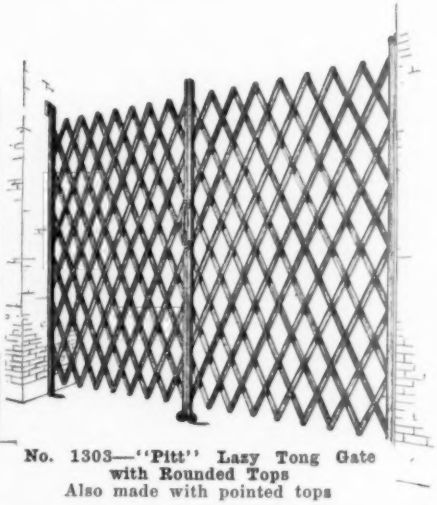


At Right
No. 1284 — "Pitt-Bostwick" Vestibule or Window Gate with Stationary Top and Hinged Lifting Bottom Tracks





No. 1262—"Pitt-Bostwick" Gate with Cast Pickets, Hinged Stiffening Bars and Hinged Lifting Bottom Tracks



No. 1303—"Pitt" Lazy Tong Gate with Rounded Tops
Also made with pointed tops

POTTER MANUFACTURING CORP.

Enclosed Spiral and Straight Tubular Fire Escapes

4800 Kimball Avenue, Chicago, Ill.

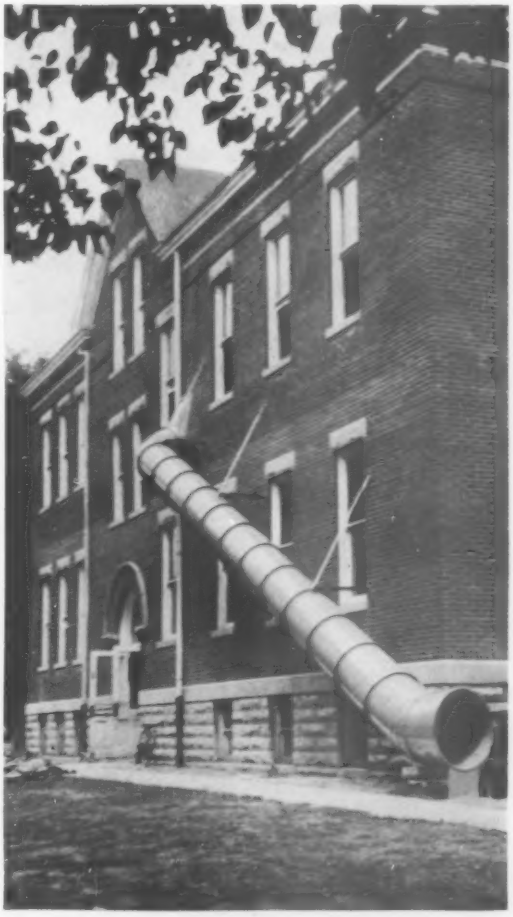
The POTTER
(Direct Entrance)
Spiral FIRE ESCAPE

Do not confuse Spiral Fire Escapes built previous to February, 1933, with the POTTER Spiral. Many improvements in design and the use of more durable materials have made the two incomparable.

Especially for buildings higher than two stories having architectural beauty, the advantages of the Spiral Escape are obvious.

Constantly improved since its invention the POTTER Tubular Fire Escape today is still recognized as being the safest and most practical fire escape for Schools and Hospitals. More than 3500 of these escapes are now in use throughout the United States and Canada. Never has there been loss of life or panic in a building equipped with this escape.

Delay in the purchase of most equipment might only result in a temporary loss in educational efficiency and progress, but delay in the purchase of a fire escape might result in the loss of many lives.



The POTTER (Direct Entrance)
Tubular FIRE ESCAPE

RAY PROOF CORPORATION

6905 Ridge Boulevard, Brooklyn, N. Y.

RAY PROOF

LIGHT PROOF SHADES

ELECTRICALLY — MECHANICALLY — MANUALLY OPERATED

FOR

Visual Educational Rooms
Auditoriums
Lecture Rooms
Science Laboratories
Dark Rooms
Photographic Studies
X-Ray Rooms
Fluoroscopic Examinations
Eye Examination
Surgical Operating Rooms
Pathological Laboratories
Dark Room Developing

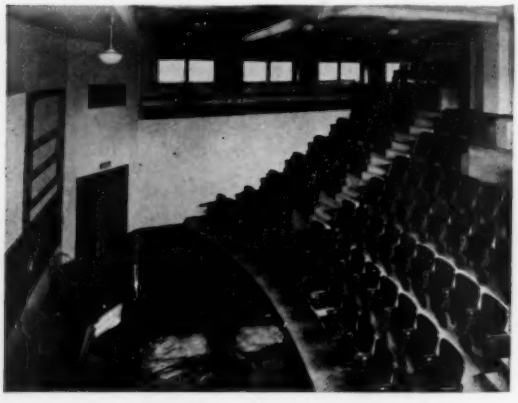
The numerous outstanding installations of our **Light Proof Shades** endorse the popularity of **Ray Proof** manufacture.

Selected for schools, hospitals, auditoriums, X-Ray departments, surgical operating rooms, as well as class rooms for visual educational work, determines the high regard for **Ray Proof** equipment by architects and institutions.

The refinement of detail, care and precision in manufacturing and installing, ease and permanency of operation and negligible maintenance requirements are just a few factors we stress. Every job, without exception, receives extremely careful study as to detail and application, assuring results that speak for themselves.

A **Ray Proof** product is always of high quality. It is your bond of protection supported by the established integrity of the **Ray Proof Corporation.**

We maintain an engineering department to advise, design and to furnish you with complete details and information for your guidance. Please feel free to use it.



WRITE FOR COMPLETE DETAILS AND SPECIFICATIONS

THE AMERICAN SCHOOL AND UNIVERSITY

REPUBLIC STEEL CORPORATION

General Offices: Cleveland, Ohio

SALES OFFICES AND DISTRIBUTORS IN ALL LARGE CITIES

The fact that school and university buildings represent long-time investments running into many thousands of dollars makes the selection of pipe a decision of real responsibility.

TONCAN COPPER MO-LYB-DEN-UM IRON PIPE

Many schools and colleges today are equipped with rust-resisting, cost-saving Toncan Iron Pipe in plumbing and heating systems. The selection of Toncan Iron in every case followed a thorough investigation of its qualities and service records.

Toncan Iron is a highly refined open hearth iron with which is alloyed the correct proportion of copper and molybdenum. Tests in the laboratory and in actual service have shown that it possesses the maximum rust-resistance of any ferrous material in its price class. This quality makes for longer, trouble-free life in all types of service in buildings, with a resulting economy hard to estimate, because repairs to inferior pipe can soon mount to almost unbelievably high figures.

Toncan Iron Pipe is easy to work—it bends, cuts and threads easily, the savings in fabrication and installation often more than offsetting its slightly higher cost.

It is made in standard and extra heavy weights, black and galvanized. It can be used wherever pipe is required in air, gas, hot and cold water, steam mains and returns, drainage and vent lines, with highly satisfactory results.

Every length of Toncan Iron Pipe is painted blue and marked with the name Toncan in raised letters. Couplings are blue and stamped TM.

Write for a copy of "Pipe for Permanence"—sixty-four pages of interesting money-saving information and facts about the remarkable performance of this rust-resisting pipe.

Toncan Iron Sheets—Toncan Iron is also available in sheet form. It is ideal for all exposed metal work—roofing, gutters, downspouts, ventilating ducts, etc. It is ductile, therefore easy to work. Its resistance to corrosion is uniform throughout the entire thickness of the sheet. Hundreds of installations are illustrated and described in "The Path to Permanence," a copy of which will be sent upon request.

We shall also be glad to send catalogs showing complete laboratory equipment made of Toncan Iron.

1

1. All steam return lines in the Bethesda, Md., High School are rust-resisting Toncan Copper Molybdenum Iron.

2. The hot water distribution system of John Carrol University, Cleveland, Ohio, is protected against rust by galvanized Toncan Iron Pipe.

3. Ventilating hoods and ducts of Toncan Iron and Enduro Stainless Steel in the New Chemical Building, State Teachers College, Murfreesboro, Tenn.

4. Typical piece of Toncan Iron Laboratory Furniture.

5. Toncan Iron Furniture in a modern research laboratory.

2

3

4

5

ROBBINS FLOORING COMPANY

Members M. F. M. A.—N. H. F. C.

Manufacturers of

NORTHERN HARD MAPLE, BIRCH AND WISCONSIN OAK FLOORING
"IRONBOUND" WOOD BLOCKS AND STRIPS, PARQUETRY

Mills: Rhinelander, Wis
Newberry, Mich.

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PRODUCTS

ROBBINS Hard Maple, Birch and Wisconsin Oak Strip Flooring, Bowling Alley and Squash Court Maple, Individual Piece Blocks for Laying in Mastic. "IRONBOUND" Unit and Continuous Strip Blox. Special Flooring Items made to order.

FEATURES

Exceptional Durability.
Smooth, non-slippery surface.
Beauty in color and texture, restful appearance.
Moderate initial cost, low maintenance outlay.
Warmth, foot-comfort, resilience.
High sanitary qualities.

ROBBINS HARD MAPLE FLOORING, STRIP TYPE, WAS SELECTED BY THE MINNEAPOLIS SCHOOL BOARD FOR THIS SCHOOL. RAMSEY JUNIOR HIGH, MINNEAPOLIS, MINN.
Minneapolis School Board, Architects; Midwest Contracting Company, Minneapolis, Minnesota, Contractors

STRIP FLOORING

ROBBINS Strip Flooring is Nature's ideal product—grown and processed in Upper Michigan and Wisconsin, "M. F. M. A." graded from properly seasoned, kiln dried lumber, made in all standard sizes and grades from ⅜" x 1½" to $^{53}/_{32}$" x 3¼" face width. Specified many years for laying on sleeper construction for nailing.

BLOCK FLOORING

Herringbone Single Piece Blocks are made with flat backs and special grooves for laying in mastic. Each piece supported by six adjoining pieces. A strongly-built, practical floor, fully able to withstand the rigorous treatment given school room floors.

"IRONBOUND" Unit Blox are assembled in squares, rectangles and panels, the entire floor interlocked with saw-tooth steel splines. A most substantial attractive school room floor. By test the best constructed unit block in existence.

"IRONBOUND" Continuous Strip Blox are of uniform length, laid in straight courses, tied in with long steel splines, making the strongest, most durable wood floor known. Combines the simplicity of strip flooring with the uniformity of parquet.

All ROBBINS mastic-set floors are absolutely squeak-proof, non-resonant, more fire resistant than other types, chemically treated to prevent vermin attack.

PARTIAL LIST OF EDUCATIONAL BUILDINGS USING ROBBINS FLOORING

Princeton University, Princeton, N. J.
Penn State University, State College, Pa.
Fordham University, New York City
Vassar College, Poughkeepsie, N. Y.
Amherst College, Amherst, Mass.
Women's College, San Francisco, Calif.
J. E. Burke High School, Boston, Mass.
Walton High School, New York City
24 Grade and High Schools, Long Island, N. Y.
Pocantico Hills School, Pocantico Hills, N. Y.
Grant Union High School, San Francisco, Calif.
Arlington School, Lexington, Ky.
Grade and High School, Burlington, Iowa
High School, Inverness, Mont.
Grade and High Schools, Oklahoma City, Okla.
Schools at Fredonia, Kans., Carys Brook, Va., Terre Haute, Ind., Ottumwa, Iowa, Mt. Grove, Mo.
Grammar School, West Point, N. Y.
Virginia State College for Negroes, Petersburg, Va.

Because of its well earned reputation for quality and uniformly fine workmanship, ROBBINS Flooring is specified by architects for more educational buildings than any other brand of hardwood flooring. **Write for our new 44 page brochure, "Late American Floors,"—a comprehensive, concise, discussion of mastic-set wood floors, designed to aid architects, engineers and school executives.**

INSTALLATION OF BLOCK TYPE MAPLE, VOCATIONAL SCHOOL, MANITOWOC, WISCONSIN
Wm. Raeuber, Architect; Schuette Construction Company, Contractors

THE SAFE TREAD COMPANY

Manufacturers of

The Improved Abrasive Metal
—"SAFE TREAD"—

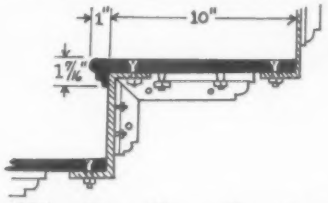
(Listed by the Underwriters Laboratories)

IRON — BRONZE — ALUMINUM

220 Broadway, New York City

AGENTS IN ALL PRINCIPAL CITIES

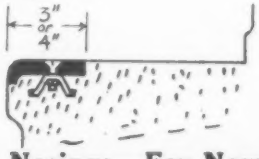
The necessity of providing slip-proof walkways for the safety of children and teachers has been established by the courts.



Style N5—For New Construction

Maintenance costs are likewise of utmost importance.

The use of "Safe Tread" Stairtreads—Door Sills, Platforms, Landings, etc., for new construction or repairs to existing walkways will insure the highest degree of **Nonslip** qualities and the greatest amount of **wearability.**

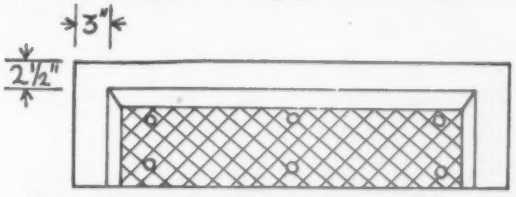


Style XL Nosings—For New Concrete

When Ordering or Requesting Quotation

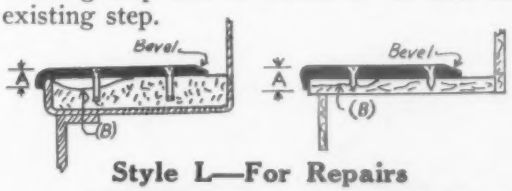
Specify iron, bronze or aluminum Safe-tread—style nosing desired, width overall or back of nosing, length, surface design (see below), quantity of each size. If unusual shapes are required furnish detail sketch or template. If for repairs advise what type material is being covered.

Submit your walkway problems to us, we shall be glad to help you solve them.



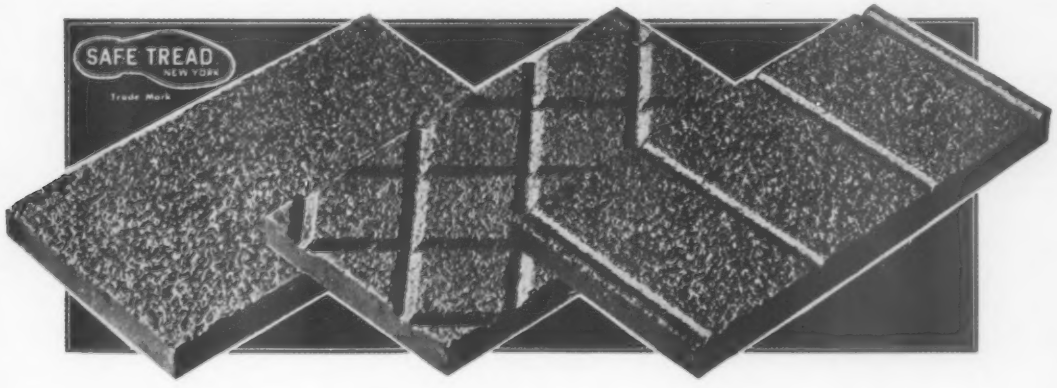
Style L— Lip Along Front Edge, Beveled Backs and Ends

Recommended practice for repairs carry new tread to within 2½" of back edge of existing step and to within 3" of side of existing step.



Style L—For Repairs

	CONCRETE OR PAN FILLED	WOOD, MARBLE OR STONE
(A)	¼", ½", ¾", 1" or 1½", whichever required to cover worn area.	
(B)	Fill worn spots with cement before putting new treads in place. Secure with lead sleeves and wood screws.	



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SCHWARZE ELECTRIC CO.

Special and General Service Sound Signals and Accessories

Adrian, Michigan

ESTABLISHED 1904 — OFFICES IN PRINCIPAL CITIES

PRODUCTS

Bells, Buzzers, Horns, Sirens, Kode-Kall.

CHARACTERISTICS

Instantaneously responsive, clear sounding, distinct. Built to highest electrical and mechanical standards for utmost dependability.

USES

Program clock, code paging, fire alarm and general signaling systems.

FINISH

Bodies: regular, black; fire duty, red. Gongs: Special Steel (nickel plated, parkerized black or udylite) and Cast Bell Metal (lacquered).

Bulletins covering our complete line on request

FAMOUS "CYCLONE" VIBRATING BELLS

For class rooms, corridors, yard and general service.

COMMON FEATURES —Regularly weatherproof; cast iron frames; plunger type; loud, even ringing; surface, conduit or outlet box mounting.

NO. 700 SERIES—A.C. only. Non-contact; polarized, 6-volts and higher, 25 or 60 cycles; parallel or series circuits. Gong sizes 3" to 12".

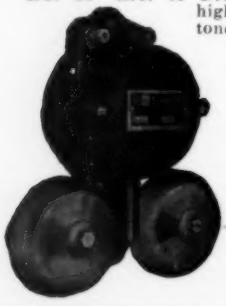
NO. 6-F—D.C. only. 4 volts and higher. Parallel circuits only. Gong sizes 6" to 12".

SINGLE STROKE BELLS

For code signaling, fire alarm, etc.

NO. 37—A.C. or D.C. 6 volts and higher. Series or parallel circuits. Cast iron frames, weatherproof, plunger type. Surface, conduit or outlet box mounting. Specify 37-A for A.C.; 37-D for D.C. Gong sizes 3" to 12".

NO. 26—A.C. or D.C. Monitor type. 6 volts and higher. 3" Bell Metal Gong, soft toned. Interior use only.



DOUBLE GONG BELLS

For class rooms, corridors and general service.

NOS. 9 and 11—A.C. only. 6 volts and higher. Gong sizes 2½" to 10".

NO. 35—D.C. only. Up to 40 volts. Gong sizes 2½" to 4".

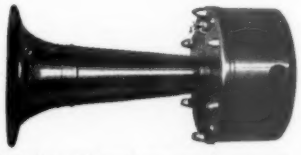
NOS. 22 and 23 — D.C. only. Up to 30 volts. Gong sizes 6" to 12".

MANFINDING KODE-KALL

A simple, inexpensive, dependable, automatic paging system for schools, dormitories, libraries, institutions, etc. Sounds 30 different code signals. Repeats signals three times. Easy to install. Special bulletin on request.

ALL PURPOSE VIBRATOR HORNS

For fire alarm, code signaling and general service.



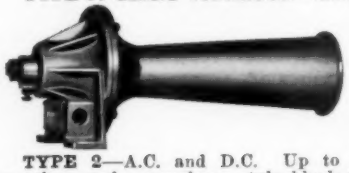
TYPES 18 and 3.

COMMON FEATURES—Weatherproof or non-weatherproof; instantaneously responsive, clear sounding, distinct; surface, conduit or outlet box mounting; projectorless, megaphone or 2-directional projectors. 5½" diaphragm. OPTIONAL FINISHES—Regular, black; fire duty, red.

TYPE 18—A.C. only (50-60 cycles). Up to 220 volts. Contactless, synchronous vibrator; outside tone adjustment; Series or parallel circuits. For outdoor use, specify 18-WP.

TYPE 3—A.C. (25-40 cycles) or D.C. up to 220 volts. Parallel circuits only. Heavy duty tungsten contacts. Specify 3-A for A.C.; 3-D for D.C.; 3-WP (A or D) for outdoor use.

TYPE 60 GIANT VIBRATOR—A.C. only. 110 or 220 volts (50-60 cycles). Powerful, penetrating. Weatherproof. ½" tapped conduit connection. FINISH: black or red. 6¼" diaphragm.



TYPE 2—A.C. and D.C. Up to 110 volts. Non-weatherproof, megaphone style black finish only. Specify 2-A for A.C.; 2-D for D.C. 3½" diaphragm.

TYPE 150 WEATHERPROOF SIREN

A.C. or D.C. up to 250 volts. For fire or any emergency signaling purpose. High speed, ball bearing motor. Instantaneously responsive, powerful, penetrating. Integral terminal box with ½" tapped conduit connection. Tilting bracket. Finish, red. Special bulletin on request.

MISCELLANEOUS

Light and heavy duty buzzers; light and intermediate duty bells; non-electric, hand-trip bells; protective housings; gong guards; hanger plates; wood mats; break glass stations; concealed bell-buzzer combinations; transformers; relays, etc.

THE SIMS COMPANY

Storage Type Water Heaters

Erie, Pennsylvania

"We Keep Others in Hot Water"

Hot Water in Abundant Supply is of first importance in public school and college buildings. Hot water in excess of maximum demand is better than just enough, or too little, in both quantity and temperature. Be liberal, and avoid complaint.

Sims "J" Type Water Heaters are designed to meet a wide range of service, for water heating purposes, covering every possible demand except the furnishing of hot water for domestic use in the individual home. "J" Heaters are water tube type: water in the tubes, steam in the shell. The tubes are ¾" 17 BWG seamless drawn copper, mill tested at 1000 pounds pressure; bent U-shape by a process which does not distort the tube, both ends being expanded into a heavy forged steel tube plate. A lead tube support and spacer keeps the tubes in perfect alignment and prevents sagging.

Swimming Pool Heaters always operate under forced circulation and in large volume; the temperature is low, requiring a comparatively small amount of heating surface. Tubes in pool heaters are arranged in two passes, giving ample area for the volume of water being circulated. These heaters may be installed either vertical or horizontal.

General Service Heaters, Instantaneous and Forced Circulation

When the steam supply is constant and ample to meet the peak demand, this type of heater can be used to advantage; steam is used only when water is being drawn. When installed in connection with a two-pipe or return circulation system, hot water is available instantly at every faucet. Water storage is not necessary with this installation. (Either vertical or horizontal.)

General Service Heaters—Instantaneous Gravity Circulation

This four-pass heater is designed for use in connection with a two-pipe or return circulation hot water system, hot water being available instantly at every faucet at a maximum temperature of 140 degrees.

Maintaining a Reserve Supply

To meet the peak demand in every water heating system, a reserve supply must be provided—either in boiler capacity or in storage of hot water. When the steam supply is limited, water storage is necessary—not less than 50 per cent of the peak hourly demand. This service can be taken care of either with a storage tank containing a steam tube element, or with a storage tank and separate water heating unit.

Special Construction

For steam or water pressures higher than 100 pounds, for service requiring bronze tube plates, composition or special tubes, or other combinations, special quotations will be figured to meet definite specifications.

Write for illustrated booklet giving Architectural and Engineering Data on SIMS Type "J" Water Heaters and Storage Heaters (see illustration).

With "U" Tubes

THE AMERICAN SCHOOL AND UNIVERSITY

THE STANDARD ELECTRIC TIME CO.

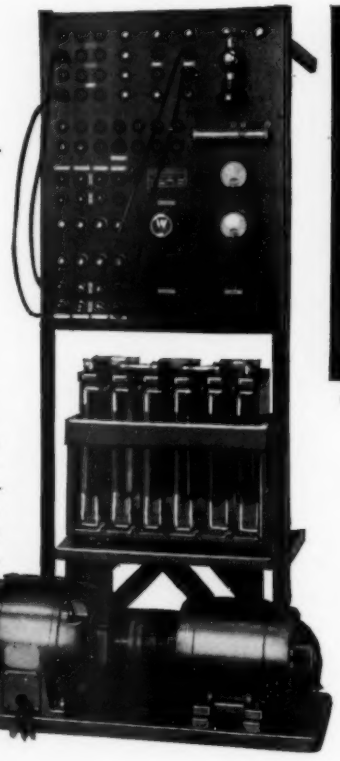
Springfield, Mass.

BRANCHES IN MANY PRINCIPAL CITIES

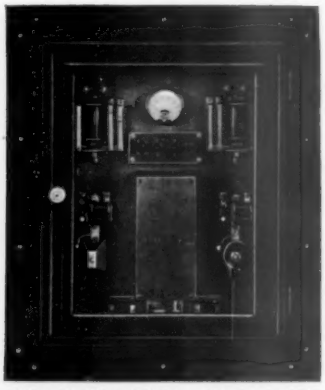
Manufacturers of

"STANDARD" ELECTRIC TIME, TELEPHONE AND FIRE ALARM EQUIPMENT, LABORATORY CURRENT AND SOUND DISTRIBUTION SYSTEMS

Master Clock



Laboratory Panel Equipment With Storage Battery and Motor Generator for Small High Schools



Closed Circuit Fire Alarm Panel and Cabinet

Standard Fire Alarm Equipment

An excellent supervised closed circuit system for schools. Break glass stations and master code signal gongs promote safety by sounding identical signals for both drills and fires. Approved by NBFU.

Standard Electric Time Equipment

Controlled by a self-winding master clock, "STANDARD" Time Systems are synchronized each minute, supervised hourly and automatically corrected if fast or slow. Correction span of 25 minutes in one hour exceeds any other available today. System is highly flexible for adjustment to program changes. Secondary clocks in wide variety of designs for every location and to harmonize with any decorative scheme.

Standard Electric Laboratory Equipment

The "Standard" laboratory voltage distribution system distributes various voltages to tables and benches permitting a number of different experiments to be conducted simultaneously. Exclusive features include jack construction assuring perfect contact, colored for ready selection of various voltages, sectional battery charging and convenient table receptacles — all "Standard" contributions for the benefit of science teachers and students alike.

Standard Electric Telephone Systems

Consists of combination bell control board and central telephone station. Raising of receiver signals office. All conversations may be supervised if desired. May be installed in combination with program bells utilizing same signals and bells. Also Radio and Sound Distribution Equipment with distinctive features that enrich the whole school program.

Wall Phone with Watch Case Receiver

THE HALSEY W. TAYLOR CO.

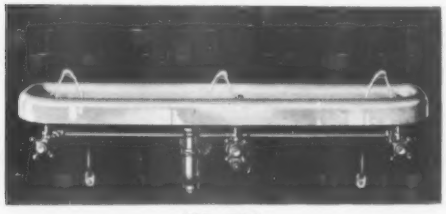
AUTOMATIC STREAM CONTROL DRINKING FOUNTAINS

Warren, Ohio

OFFICES IN PRINCIPAL CITIES

Products of Specialization

Halsey Taylor Drinking Fountains are made and sold by the largest organization devoted exclusively to this line of manufacture. We aim to produce the best fountain for public or parochial school use, and invite school authorities and architects to write us on any problem concerning school drinking-water provision. Halsey Taylor fountains embody many distinctive features which promote sanitation, convenience and operating economy and service, some of which are briefly listed below:



NO. 703
The type shown can also be had with two or four heads

Ideal Drinking Mound

The Halsey Taylor two-stream projector is an exclusive feature which makes the side stream really practical, and removes the objections ordinarily found with sidestream types. It is an invaluable advantage where the health of children is concerned, as in school installations.

Absolute Sanitation

The drinking mound is formed by the converging of two streams of water, thus setting up an interference forming a localized drinking mound which makes it impractical to drink from any other point. Hence Halsey Taylor fountains are sanitary in the extreme. Fingers or lips cannot come in contact with or contaminate the source of supply. Squirting is impossible, hence children cannot tamper or play with a Halsey Taylor.

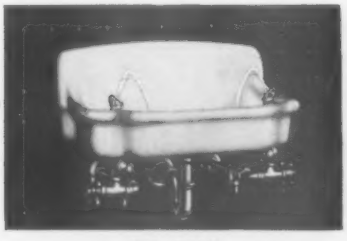
Floor-connected Pedestals

NO. 568 NO. 520

NO. 2605

NO. 2609

Vitreous China and Cast-iron Vitreous Enamel Fixtures for Every School Purpose



NO. 2610
Vitreous China with Two Projectors, Highly Desirable for School Use

Practical Automatic Stream Control

An automatic device maintains a constant height in the drinking stream, even though line pressure may vary. The stream is never too high, never too low.

Write for New Catalog

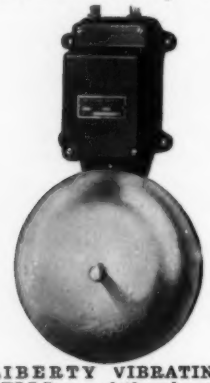
This illustrated catalog details all the many popular models of Halsey Taylor fountains made for any building need, and especially school requirements. Send for it.

THE THOMAS-SMITH COMPANY

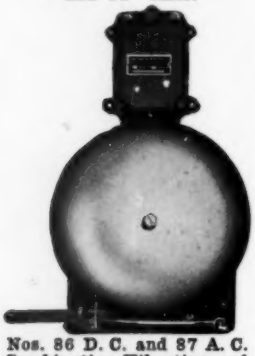
Canton, Ohio

BRANCHES IN PRINCIPAL CITIES

Electrically and Mechanically Operated Fire Alarm Systems
Electric Bells and Signals



LIBERTY VIBRATING BELLS are of the plunger hammer type. Nos. 6-Jr. D. C. and 7-Jr. A. C. are made in 3", 4", 5" and 6" sizes, and Nos. 6 D. C. and 7 A. C. in 6", 8", 10", 12" and 14" sizes.



Nos. 86 D. C. and 87 A. C. Combination Vibrating and Mechanical Bells are especially adapted for fire signals. They are made in 8", 10" and 12" sizes.

Nos. 811 D. C. and 812 A. C. Combination Single Stroke and Mechanical Bells are also adapted for fire signals. They are made in 6", 8", 10" and 12" sizes.

PRODUCTS

Manually Operated Fire Alarm Systems;

Electrically and Mechanically Operated Fire Alarm Systems;

Vibrating and Single Stroke Bells for Direct or Alternating Current;

Combination Electrical and Mechanical Bells;

Aluminum Grids to fit all sizes of bells;

Steel housings for all sizes of bells.

THOMAS-SMITH FIRE ALARM SYSTEM FOR SCHOOLS

(Illustrated at Right)

This manual fire alarm system for schools is approved by architects and conforms with state codes. It is the only system having a rigid rod connecting the alarms on the different floors of the school buildings. Other constructive features are:

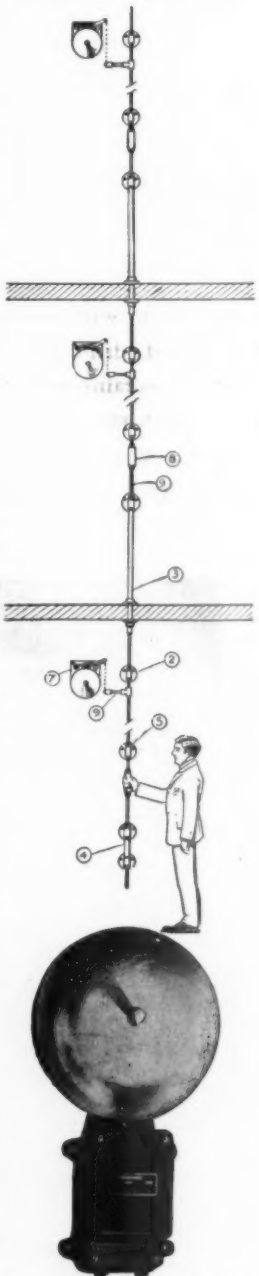
1. Supports are adjustable to take care of uneven walls or misalignment of succeeding floors.
2. The floor tube is adjustable, to allow for floors of various thicknesses, and it extends up from the floor to prevent any obstruction in operation.
3. The spring is totally enclosed and positive in action.
4. All supports and tubes are bushed with brass, lacquered.
5. Finish is enamel. Colors, red, black or buff.
6. The bells are the best made.
7. The handles are of polished brass, lacquered.
8. The operating rod is a continuous steel tube, operating gongs on all floors simultaneously.
9. Wood mats are supplied for mounting supports and gongs.

Combination electrical and mechanical bells can be furnished with above fire alarm systems for operation wtih electrical ringing systems.

THOMAS-SMITH LIBERTY BELLS

Thomas-Smith Liberty Bells cover all types and sizes from 4-inch to 20-inch, vibrating or single stroke, 110 volt, 220 volt, all standard transformer voltages, battery operations, direct or alternating current. Weatherproofed types are furnished if desired at a small additional cost. \ll Thomas-Smith Liberty Bells embody the very finest workmanship and materials. Thomas-Smith Aluminum Grids are made to fit all sizes of bells. They fit snugly at the base of the mechanism over the shell and are bird-proof.

Write for catalog of Thomas-Smith Fire Alarm Systems and Liberty Bells.



LIBERTY SINGLE STROKE BELLS, Nos. 12 A. C. and 11 D. C. Made in 5" to 14" sizes. Bells contain no springs nor moving parts except plunger.

WARREN TELECHRON COMPANY

Manufacturers of Telechron Timekeeping Equipment

GENERAL OFFICE AND FACTORY

Ashland, Mass.

DISTRIBUTORS AND REPRESENTATIVES IN PRINCIPAL CITIES
In Canada: Canadian General Electric Company, Ltd., Toronto, Ont.

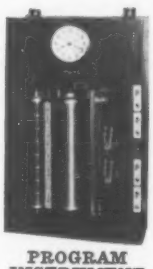
*Telechron**
TRADE-MARK

DOUBLE-FACE METAL CASE WALL MODEL

The Modern Timekeeping System for Schools

Every type of school building . . . large or small . . . new or modernized . . . can benefit by the accurate, economical timekeeping that a Telechron system supplies. Both supervisors and students agree that these silent, precise timekeepers are a definite help in smoothing out academic schedules.

Each Telechron Clock is a sturdy, independent timekeeper which can be installed as a single unit or as a part of a complete system with central control equipment. "Scattering" is impossible, because the entire system is synchronized by the regular impulses of the alternating current supplied by almost every electric power company. Telechron systems have proved to be most economical. The original cost is low — maintenance and operating costs are trifling.



PROGRAM INSTRUMENT FOR OPERATING CLASSROOM, CORRIDOR AND OUTDOOR SIGNALS

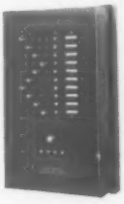
ROUND METAL CASE CLASSROOM CLOCK

We have supplied modern, built-in timekeeping equipment for scores of well-known school buildings. A letter will bring one of our representative to discuss your particular problem with you.

TELECHRON TIMEKEEPING EQUIPMENT FOR SCHOOLS INCLUDES CLASSROOMS, LOBBY AND AUDITORIUM CLOCKS, PROGRAM INSTRUMENTS, COMBINATION SIGNAL CONTROL BOARDS, SIGNAL EQUIPMENT, OUTDOOR AND TOWER CLOCKS, AND CENTRAL CONTROL EQUIPMENT

MARBLE CLOCK FOR AUDITORIUM, FOYER, ETC.

AUTOMATIC RESETTING DEVICE FOR CONTROLLING ADMR (Automatic Dual Motor Resetting) CLOCK SYSTEM



COMBINATION SIGNAL CONTROL BOARD FOR INDIVIDUAL CLASSROOM SIGNAL CONTROL

** Telechron is the trade-mark, registered in U. S. Patent Office, of Warren Telechron Company.*

SOUTHERN JUNIOR HIGH SCHOOL, SOMERVILLE, MASS., IS EQUIPPED WITH AN ADFR (AUTOMATIC DOUBLE FREQUENCY RESETTING) SYSTEM, CONSISTING OF 60 TELECHRON CLOCKS, PROGRAM INSTRUMENT AND AUTOMATIC CENTRAL CONTROL EQUIPMENT. ORIGINAL INSTALLATION IN 1924—RITCHIE, PARSONS & TAYLOR, ARCHITECTS, BOSTON, MASS. EXTENSIONS IN 1931—JOHN P. HEFFERMAN, BOSTON, ARCHITECT

THE WESTERN SHADE CLOTH CO.

General Offices and Factories: Cermak Road at Jefferson St., Chicago, Ill.

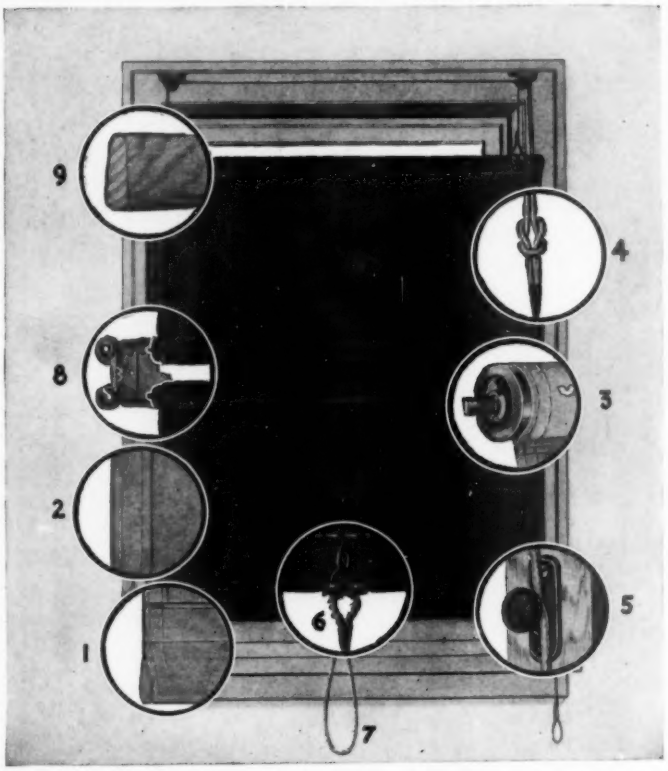
Atlanta Buffalo Indianapolis Detroit St. Louis Omaha Columbus Pittsburgh Indianapolis

"DIPLOMA"

Window Shade Equipment

15 SUPERIOR FEATURES

1. **EXTENSION HEM.** Lower sash shades have 1 inch extended hem as protection against damage when grasping.
2. **REINFORCED HEM.** A narrow shade cloth strip stitched along edges for a distance of four inches above the hem serves as a protection against tearing.
3. **ROLLER SLEEVE.** On down rolling shades the rollers are inserted in a special sleeve and stapled. Prevents tearing from roller.
4. **CONTROL CORD** is adjustable to take up slack.
5. **CORD CLEAT** on lower casing provides firm lock for operating cord.
6. **SNAP-ON FASTENERS.** Eliminate eyelets which weaken the slats.
7. **GLAZED CORD.** Extra heavy stretch resistant cord. Smooth and sanitary.
8. **LIGHT STRIP.** Ribbed, telescoping light strip with attached brackets. Shades cannot jump out.
9. **HEAVY SLATS.** Large size 1¼ in. best grade straight grained white pine.
10. **STAPLES** at each side of hems prevent pulling away.
11. **"STANDARD" ROLLERS.** 1 inch minimum size. Guaranteed.
12. **LOOPED CORD ENDS.** Clinched with metal fasteners. No unsightly knots.
13. **TWO-POINT SUSPENSION.** Upper shades have two-point suspension for ease of operation and to equalize the strain on the slat and fabric.
14. **PULLEYS.** Smooth running and sturdy.
15. **BRONZE FINISH.** All hardware, including roller ends, is of attractive rust proof bronze finish.



"Diploma" Window Shade equipment has no equal. Months of careful study have been spent in its development. Every detail has been carefully worked out to correct some specific weakness common to window shade equipment of the past. So simple that children can safely operate it. Entirely "fool-proof"—there is nothing to get out of order. We believe this to be the most important development in window shade equipment in recent years and feel that in it we have successfully met all the problems that for years have proven a constant source of trouble in the school room.

Manufacturers also of the following school needs:

Motion Picture Screens—

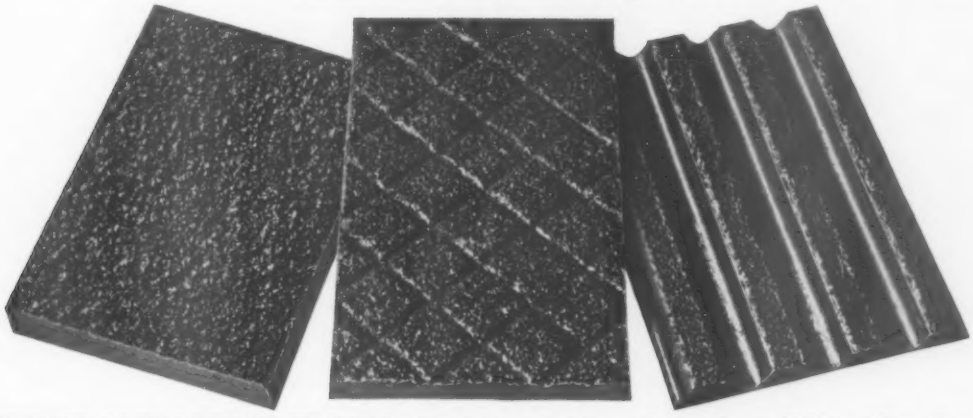
Book Binding Fabrics

Write for further information.

WOOSTER PRODUCTS INC.

Wooster, Ohio

New York Office: 101 Park Ave. Chicago Office: 324 W. Washington St.



WOOSTER SAFE-GROOVE TREADS—Steel Base, Yellow Brass Base, White Alloy Base
WOOSTER ABRASIVE CAST TREADS—Ferrogrit, Alumogrit, Bronzogrit, Nicklogrit

Stairs Must Be Safe

Wooster Safety Treads eliminate the hazard of slipping on smooth worn and hollowed out stairs; they eliminate wear and tear on the original walking surface of the stairs and prolong indefinitely the effective life of the stairway.

Treads for New Construction

The abrasive rib type of tread shown at the right above is particularly adapted to protecting the walking surface of new sheet pan stairs, concrete or wood construction. Cast treads with abrasive grits embedded in the walking surface and with either cross-hatched, fluted or plain surface may be used with self-supporting type of stairs, or as a safety tread placed over other sub-treads.

Treads for Repair

Wooster Safety Treads afford a most efficient means of repairing, renewing and modernizing old, badly worn stairs at a moderate cost. The work can be done by any mechanic, or the custodian. Because of the great variety of standard types produced, you can find in Wooster's complete line exactly the right type of safety tread for any type of stair construction.

Wooster Safe-Groove Treads can be furnished in steel, brass or white alloy (a hard, Heat-treated aluminum alloy) base, with abrasive grits, or lead, anti-slip filler, in a number of different widths and sections.

Wooster Abrasive Cast Treads are made of cast iron, cast aluminum, cast bronze or cast nickel bronze, having the abrasive grits firmly and securely embedded at the time of casting to provide a slip-proof surface and unusually durable material. Various styles of nosings are available; treads are cast in any size according to specifications.

Wooster Security Nosing

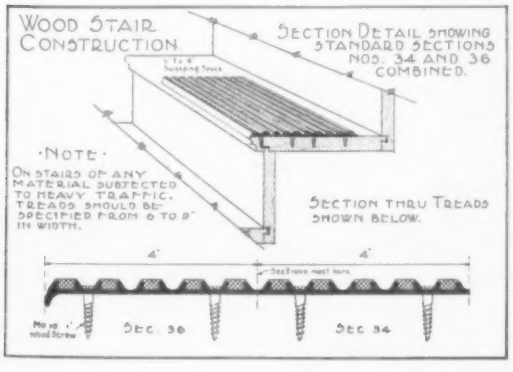
Used with floor coverings on stairs to protect exposed edges and prolong the life and appearance of the material indefinitely. Widely used with linoleum or rubber for covering table, counter or desk tops subjected to hard usage. Made of solid extruded Yellow Brass or White Alloy Metal in a variety of new, ultra-modern designs; highly decorative; resistant to acid or chemical stains.

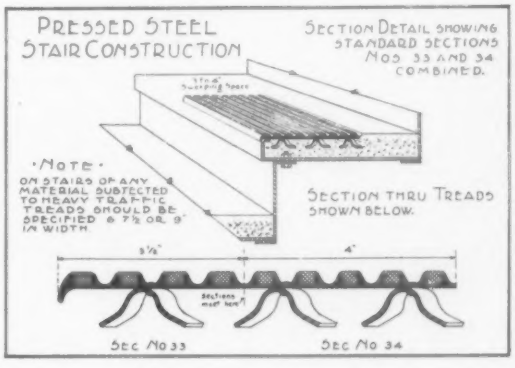
Wooster Security Edging

Protects edges of rugs and runners of linoleum, rubber, etc., in classrooms, dormitories, halls and corridors enhancing the appearance. Used with same materials in renovizing tops of tables, desks, cafeteria counters, etc. Made of solid extruded Yellow Brass or White Alloy Metal. Highly resistant to acid or chemical stains.

Wooster Metal Trim

Simplifies the job of renovizing and modernizing the walls in dormitories, classrooms, offices, auditoriums, cafeterias, kitchens, bathrooms; facilitates the installation of modern flexible or rigid wall covering materials of linoleum, rubber or asbestos tile, plywood or hardboards and enhances their appearance. Made of solid extruded White Alloy Metal, a strong, heat-treated aluminum alloy, or stainless steel. Standard finish is Woosterlite, a brilliant, mirror-like surface resembling chromium, or a satin finish of silvery white. Also available in seven colors.

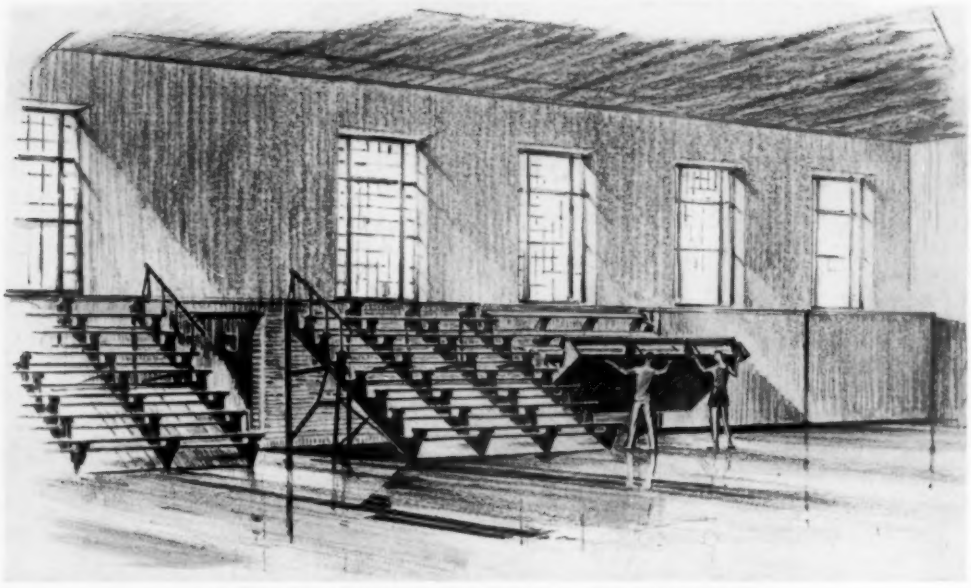

WOOD STAIR CONSTRUCTION
SECTION DETAIL SHOWING STANDARD SECTIONS NOS. 34 AND 36 COMBINED.
·NOTE·
ON STAIRS OF ANY MATERIAL SUBJECTED TO HEAVY TRAFFIC, TREADS SHOULD BE SPECIFIED FROM 6 TO 9" IN WIDTH.
SECTION THRU TREADS SHOWN BELOW.
4"
4"
SEC. 36
SEC. 34


PRESSED STEEL STAIR CONSTRUCTION
SECTION DETAIL SHOWING STANDARD SECTIONS NOS. 33 AND 34 COMBINED.
·NOTE·
ON STAIRS OF ANY MATERIAL SUBJECTED TO HEAVY TRAFFIC TREADS SHOULD BE SPECIFIED 6 7½ OR 9" IN WIDTH
SECTION THRU TREADS SHOWN BELOW.
4"
SEC NO 33
SEC NO 34

SUPERIOR SEATING COMPANY, INC.

105 W. 40th Street, New York City

GYMSEATING



THE ADAMSON FOLDING GRANDSTAND

Adamson "GYMSEATING" is designed to furnish the following essential elements necessary to make available at will the floor space occupied by mass seating and to devote it quickly and easily to other uses.

1—Correct Vision.
2—Absolute safety.
3—Quick and easy manipulation with the least amount of energy and the maximum safety.
4—Flexibility of application and adaptability to various conditions without interference with appearance or architectural character.
5—Absence of all mechanical devices, such as springs, gears, pulleys, cables, worm screw drives, etc.
6—Suitability for any type of design of wainscot and protection of same under all conditions.
7—Sturdy construction of the best and most suitable materials to insure long life without upkeep.

Further information on "GYMSEATING" will be forwarded upon request. Superior Seating engineers will also gladly furnish suggestions for the application of "GYMSEATING" to any problem, either in an existing building or a proposed structure. If you have a seating problem for your gym you can afford "GYMSEATING."

ADAMSON GYMSEATING 105 W. 40. N.Y.C.

SPECIALISTS IN SEATING FOR 25 YEARS

THE AMERICAN SCHOOL AND UNIVERSITY

Section III

OPERATION AND MAINTENANCE

Effective and Efficient Operation and Maintenance of a School System

BY NATE W. DOWNES

CHIEF ENGINEER AND SUPERINTENDENT OF BUILDINGS, SCHOOL DISTRICT OF KANSAS CITY, MISSOURI

IT is easy to spend other people's money—a fact which those who are responsible for the maintenance and operation of public schools will do well to keep in mind. The successful maintenance and operation of a school system composed of fifty or more buildings is a specialized field and requires at its head a trained engineer with a background of experience as a subordinate in the work. Such a person, with his knowledge of what will and will not give the desired results effectively and economically, is an invaluable counsel for an ever-changing directing board composed of the laity, who do not and cannot know the situation thoroughly.

The educational department is of course paramount in the school system and is at all times in the spotlight, since the natural tendency of board members is to look to the head of the system for educational counsel and for the solution of all problems pertaining to maintenance, operation and new buildings. It is, however, a wise educational head who recognizes that his value in the school system having fifty or more buildings lies in the administration of the educational department, for which he is specially trained and experienced, and who lets his board look direct to another, specially trained and experienced, for counsel on the problems of operation, maintenance and building.

In the Kansas City school system, there are three separate and distinct departments, each responsible direct to the Board of Directors.

1. The Educational Department, headed by the Superintendent of Schools.

2. Purchasing, Disbursing, Accounting and Recording, headed by the Secretary-Business Manager.

3. Operation, Maintenance and New Construction, headed by the Chief Engineer-Superintendent of Buildings.

To the third department will fall:

1. The maintenance of a well-trained force for operating and cleaning the buildings.

2. The maintenance of an efficient organization for all needed repairs and small improvements.

3. The establishing of standards common to all school construction, building and mechanical, and the preparation of drawings and specifications covering all such standards for new construction.

4. The preparation of specifications on all supplies, fuel, materials, etc., for procurement by the Secretary-Business Manager, which are required in operation, repair or added improvements.

The Operating and Cleaning Force

The item of an effective and efficient operating force of custodians, engineers, etc., is of prime importance. This embraces all persons engaged in the physical operation of schools—engineers, firemen, custodians, helpers, elevator operators, night watchmen, charwomen, etc. To the casual observer the heating, ventilating and cleaning of a school building is just another job of sweeping and shoveling coal into a furnace. It is, however, more than this; in fact, science and skill are involved in doing the job as it should be done.

Elementary schools vary in size from a two-room frame structure serving 50 to 60 children to a large building serving 1,000 to 1,200 children and equipped with every convenience modern standards demand. Regardless of size and equipment, the buildings must be kept comfortable and clean at all times. To maintain a desirable standard requires a supervising head who knows definitely what is wanted and specifically what is involved in attaining it, and then how to get his organization to do the job enthusiastically and with confidence in his direction. The average employee is anxious to do his job well, and with a little encouragement and recognition of his efforts will give the best that is in him.

The carrying-out of a desired program is most effectively attained through group instruction followed up with personal contact. Group instruction is usually conducted in some centrally located school by the supervisor and such "wheel-horses" from the organization as he may designate. This should be supplemented with group meetings in various buildings, with skillful demonstrations following instructions given in the classrooms. Instructions in the classroom are greatly facilitated by the use of moving pictures showing first the mistake most generally encountered and then how to do the job right. Such a course of instruction must cover the entire field, from cleaning to the operation of mechanical and electrical equipment.

The maintaining of the proper mental attitude toward school district, principal, teachers, children and patrons is very important. Unless a capable man has also the quality of getting along with people, he cannot serve long.

There should be at least one twelve-month employee at each building, the others necessary for operation to go on duty in ample time before the opening of school to put the building in condition and to remain after the close of school in the spring to leave the building in orderly condition over the summer vacation. A convincing argument for keeping the entire cleaning force through the summer is that there is sufficient profitable work such as washing of furniture, woodwork and walls, interior painting and floor sealing to keep them busy. The writer is inclined to believe that with a well-seasoned and experienced force this would be true. As a general proposition, however, the men are not qualified to give the 100 per cent result which must be secured; although in a large organization there are a surprising percentage who can work successfully under proper supervision. On an interior painting job especially, great care would have to be taken in assignments.

Through the summer vacation, custodians can seal floors, both wood and concrete, paint baseboards, stair-risers and dados, and wash walls. Major operations such as varnishing woodwork and painting are in most cases wisely assigned to men trained and skilled in that work. Gratifying results can be obtained by custodians in the treatment of floors, washing of walls and painting of such simple areas as are enumerated above, and a surprisingly large number of schools can be so conditioned at a relatively low cost, making possible a great amount of such work each year that could not otherwise be done. With floors and corridors so treated, the cleaning problem is made much more simple, dust is eliminated, and the results in general are more satisfactory. The wood and concrete are thoroughly sealed, making it impervious to ink stains and dirt, and easily cleaned with a push-mop.

Custodians should be thoroughly instructed in the harmful results of using caustic and acid cleaners. School districts are facing curtailed incomes for maintenance and operation and can ill afford to meet needless expense. Caustic cleaners should be kept out of schools entirely, for they always present to the custodian the temptation of a short-cut method of cleaning. Excellent neutral soaps are available at reasonable prices which when mixed in the correct proportion with water make effective and economical cleaners with no possibility of harming painted and varnished surfaces.

The proper operation of a heating and ventilating equipment is a most important function of custodian service.

Ventilating equipment for school buildings has for a long time been looked upon as an expensive luxury, and only cities of comparatively large income have used it. While smaller cities have installed such equipment, they have failed to operate it on account of the expense.

Heating and Ventilating

By experiment and research we have learned that we can ventilate without using outside air all the time—which has caused the large fuel expense. The modern custodian knows something about humidity, wet and dry bulb temperatures, air motion, and stratification, and their relative importance, with the result that he understands how to operate humidifiers, when to circulate air completely, or in part—and what part, and when to use only outside fresh air, which has made a big saving in fuel consumption. Such knowledge and operation have made for more comfortable conditions in the classroom and created a more wholesome respect for the custodian. The market now affords air filters at comparatively low cost, which should be made a part of every ventilating system. They pay dividends in the reducing of wall cleaning and painting to a minimum, aside from making the air more wholesome to breathe.

The custodian should be thoroughly instructed in the proper method of burning fuel. He must, of course, first have the proper kind of equipment, and must not be left on his own until he understands it thoroughly and how to operate it properly. He must know whether or not he is getting the quality and kind of fuel that the board has contracted for. He must know how to take care of this equipment so that it will always be in condition to function at maximum efficiency, and must be able to recognize all the symptoms of trouble. A combination of 95 per cent good old-fashioned common sense and 5 per cent theory makes the best custodian that can be obtained. Such a man is a great help to the principal, and soon is liked by all the teachers. At the end of the school year, when the annual reports and requisitions are being made up, he is much consulted, and when an inspection of the building is made to ascertain needed repairs and improvements he will show with directness what he thinks is needed—and he will usually be right.

The supervisor must have a method of cataloging all personnel with respect to seniority of service and qualifications and see to it that no favoritism whatever is shown in promotions. Anything short of this will cause distrust and discontent. A sense of fair dealing must prevail at all times; otherwise a supervisor is in no strategic position to discipline his men—and they do have to be disciplined.

The Repair Sub-Department

The maintenance of the physical properties of a school system is a specialized activity and for effectiveness and economy requires a sub-department organized for this purpose. Such a sub-

department must be headed by a general foreman charged with the responsibility of obtaining definite results, clothed with authority to hire and discharge, and at liberty to make whatever suggestions he sees fit in the equipping of his organization that will make for most effective and economical prosecution of the work. The difficult problem in this set-up is in the selection of the general foreman, and once the right man is found, the rest will take care of itself. Of course the whole set-up, including custodians, must be absolutely non-partisan open shop, and based strictly on merit and seniority of service.

The repair department will be composed of practically all building crafts so assembled that there will be a minimum of labor turnover, and only in the summer period when improvements that cannot be undertaken during school sessions must be made.

A fair scale of wages must be set up based on continuous employment. It is the annual income a man makes rather than the hourly rate he is able to command that he is ultimately interested in. Such a schedule will fall 15 to 20 per cent below the prevailing building trade scale, but over the entire year the school employee will receive a larger income than the building trade craftsman who depends on contract building construction for his employment. By proper planning and cooperation on the part of school principals most of the work can be spread out over the twelve-month period, an arrangement which is of course conducive to the desired minimum labor turnover.

The entire department of operation and maintenance must operate on a budget. The operating budget is more or less fixed. The maintenance and repair budget has a minimum limitation, and can be more or less expanded, depending on the amount of money available. In other words, there is a minimum below which false economy would be involved, but above which one could go, in reasonable limitations, in improvements that are desirable but not absolutely necessary. The heating and plumbing, interior painting and decorating, and flooring may be in such a condition that the school can still operate, but improving them would add to beauty and comfort.

The superintendent of buildings must be familiar at all times with the physical condition of the properties and must submit each year for approval a budget which his judgment tells him is needed to maintain the properties, and to secure such added desirable improvements as he feels the district's finances will reasonably permit. He must know the critical minimum below which it is dangerous to go, and must insist on that being allowed. He must have the full confidence of his Board and must not abuse such confidence.

Standards and Specifications

The third function of such a department is the establishing of standards for school construction, heating and ventilating, lighting, etc. Who better understands standards than the man who lives with the schools, and knows from constant experience in operation and maintenance what will and will not give satisfactory results, what is and is not expensive to operate and maintain, and what will give a maximum of service at a minimum of cost? Directors come and go, but he is there year in and year out, doing his best to keep operating and maintenance costs at a minimum.

An architect and an engineer are engaged to design and supervise the construction of a building. When the architect has accepted the building from the contractor, for the school directors, it is turned over to the maintenance department and from there on it is the building superintendent's to take care of. The architect and the engineer are charged with designing a school to accommodate a stated number of children, with enumerated auxiliaries, all to come within a fixed sum. They prepare and submit a preliminary study to the Superintendent of Schools and the Board jointly. The arrangement is finally approved, and from then on the architect and the engineer use their own judgment. If they are specialized in school work and have profited from past mistakes, the results will be acceptable. If not, the results, while accepted finally by the school directors, are not so acceptable to the maintenance department and may prove an expensive maintenance problem. So it is a wise school board that is equipped to know what it should have and what has been obtained.

The operating and maintenance department should know, through its constant use of fuel supplies and materials, what is needed, and should be charged with the responsibility of writing all specifications covering the requirements, and then should let the business department procure them, all subject to the operating and maintenance department's acceptance based on the specifications. Nothing short of such a procedure is fair to the operating and maintenance department, or will get the correct results.

Capable administration of the school system is desired by the taxpayer and the politician alike, for while taxpayers will tolerate special privilege and inefficiency in their state and local governments, they draw the line at their school systems. The school comes directly into the home, and the politician knows that political patronage applied to a school system just will not work. With this in mind, the school official should take heart and give to his job the best he has in him.

Raising the Standards of School Sanitation

BY GEORGE L. W. SCHULZ

ASSISTANT DIRECTOR, DEPARTMENT OF BUILDINGS AND GROUNDS, BOARD OF EDUCATION, DETROIT, MICH.

THE subject of school sanitation is one of vital concern to all bodies responsible for the development and maintenance of school plants, whether public, endowed, private, or parochial. The problem may be divided into two parts: first, the construction of new buildings in a way that will reduce maintenance costs to a minimum and raise standards in sanitation facilities; and, second, the proper maintenance of buildings already constructed, older in character and naturally without the modern construction features and sanitary facilities which we consider essential to the designing of new school buildings.

Construction that Automatically Raises Sanitation Standards

In considering these problems, attention is immediately drawn to the importance of constructing buildings of materials which in themselves afford the best opportunity for the application of simple cleaning methods. Materials that are not porous reduce to a minimum the possibility of retaining germs and foreign matter detrimental to the health of students. This problem of material selection and cleaning should be carefully considered by school boards, architects and engineers, and afterwards by those in charge of maintenance work.

The proper selection of building materials must bring up for consideration, first in importance, various types of flooring for different conditions; second, the most satisfactory type of wall treatment; and, third, ceiling treatments.

FLOORING

Floor coverings will vary somewhat according to usage. Classrooms in general require floors which are durable, easily cleaned, and adaptable to various types of equipment. Probably the most satisfactory type of flooring for all-around use is a good hardwood floor properly treated to seal the pores, or one of the better grades of linoleum, also treated to seal the pores against the retention of germs and foreign matter. Each of these materials when properly treated in the original installation, and before being used, should develop a floor which is easily maintained and sanitary.

For corridors, offices and special rooms, we may well consider various forms of linoleum, composition tiles, and certain types of clay tiles. Any one of these materials, properly selected and sealed to prevent absorption, would be satisfactory from a sanitary point of view, but each has its strong and weak points in appearance and acoustical properties. The more pliable and soft the material, the better the acoustics, but the life of the floor is reduced, while the harder the material, such as clay tile, the greater the wearing qualities, but it more generally results in inferior acoustics.

The question of types of flooring in toilet rooms, locker rooms, shower rooms, and plunge rooms is a special and important problem in any type of school building. Often foot problems arise which involve contagion. These foot diseases, though not fatal, cause great discomfort to those contracting them. In most cases disease germs imbed themselves in porous floors and then find their way to the feet and are difficult to dislodge. Strong disinfectants are used, but even these are not one hundred per cent effective. So it behooves one to study the possibilities of assisting in the struggle to overcome these difficulties by proper selection and assembly of materials.

We must not only consider the sanitary element of these floors, but also the problem of slipping on floors when they are wet. This requires the introduction of non-slip materials—which are generally somewhat porous. After careful study of this problem over a period of years, we have come to the conclusion that the most sanitary and at the same time satisfactory type of flooring usable in these rooms is limited to a very few types, namely, ceramic and mosaic types of non-slip flooring. Though slightly porous, these are the best types of flooring for the purpose, and they are easily cleaned and disinfected with ordinary soaps and disinfectants.

WAINSCOTS—WALLS—CEILINGS

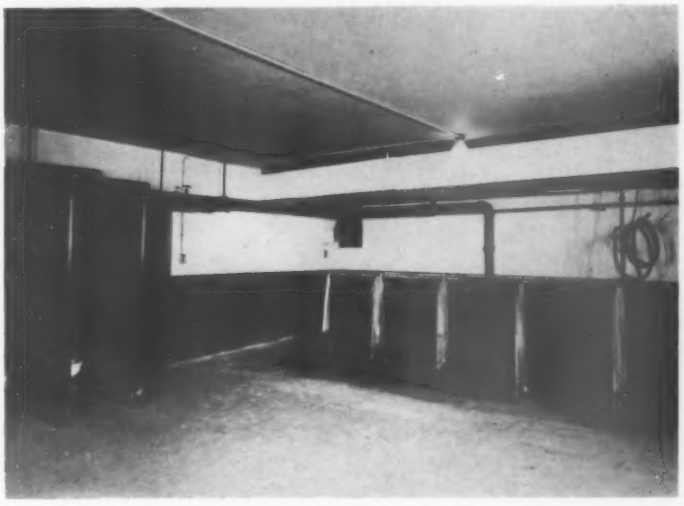
The problem of wainscots in any building, though of secondary importance when compared with floors, should be well considered, especially where walls are subject to rough treatment. Considering sanitation with maintenance problems, we come to the conclusion that the most satisfactory and most economical type of wall treatments for wainscots are hard, durable, and washable surfaces such as glazed tiles, brick, or marble. These materials, though somewhat greater in initial costs, require no painting and allow the application of simple cleaning with soap and water.

Though last in order of importance, the treatment of walls and ceilings develops into somewhat of a problem, owing to the desirability of having sanitary surfaces, satisfactory appearance, and acoustical properties. These requirements are opposite in character. The most sanitary walls are those having hard, smooth surfaces, such as plaster, which are paintable but have low acoustical

values and unless carefully decorated are not pleasant in appearance. Most materials that are pleasing in appearance and acoustically satisfactory are rough in texture, and therefore highly absorptive and quite unsanitary. However, there are ways of providing fairly sanitary wall and ceiling surfaces having correct acoustical values. These can be obtained in washable surfaced plaster walls and acoustical tiles, and generally, if proper selection is made of acoustical materials, only the ceiling, or part of it, need be treated to obtain the desired acoustical effect.

Corners and sharp right angles should be eliminated wherever possible, for these spots are the greatest harborers of disease. Sanitary coves should be used at the intersection of all floors with wall surfaces and there should be no ledges, protruding caps, or surfaces which are dust collectors. This, of course, necessitates flush joints in all places where they are obtainable. The modern and sanitary conception of school-building design tends towards simplicity of interior detail, the exclusion of all highly ornamental frills and moldings, and the substitution of simple trim.

Materials which need no maintenance except with soap and water are rapidly taking the place of those which are easily damaged and continually in need of resurfacing and other types of maintenance. This is noticeable in the increasing use of washable coved base, wainscots, window stools, toilet-stall partitions, etc., throughout new construction work.



AN EXAMPLE OF THE OLD TYPE OF TOILET ROOM IN SCHOOLS

MODERN TOILET ROOM IN A DETROIT SCHOOL

PLUMBING FIXTURES

The proper selection of plumbing fixtures and the introduction of proper methods of ventilation tend greatly to influence health conditions within school buildings.

Wonderful improvements have been made in the development of properly operating fixtures. It is desirable to select water-closet fixtures having rapid flushing features and equipped with easily cleaned composition seats with open lips at the front.

It is a question whether public school buildings should be equipped with individual lavatories or with wash-troughs or fountains. Each has its advantages; both are desirable from a sanitation point of view. It appears that selection of these fixtures rests on individual opinions as to types desired, any one being entirely satisfactory.

The floor type of fixture using an overhead tank for periodic flushing is most desirable for cleanliness. It allows for proper flushing not dependent upon the human element where forgetfulness brings about unbearable conditions in toilet rooms. All toilet rooms should have floor drains and adequate hose connections whereby the rooms can be flushed out each day.

VENTILATION

Ventilation of toilet rooms is an essential part of the design of any school building. The ventilating unit should in no way be connected to the general school ventilation system. These rooms should have not less than ten

OLD TYPE OF CORRIDOR TREATMENT

air changes per hour, and the air should be exhausted directly to the open air. Only in this way can one hope to maintain satisfactory air conditions within other parts of any building.

The general ventilation problem requires great study and careful balancing to produce satisfactory conditions in all parts of any school building. Proper sizing of ducts to individual rooms, adequate air supplies feeding into these rooms, and proper selection of air controls, all tend to influence conditions in any room.

With the development of air conditioning, we have the finest control obtainable in producing satisfactory conditions within classrooms. Air conditioning as applied to school buildings at present consists of providing the proper number of air changes per hour, at the proper humidity and temperature. These conditions are obtainable through the proper sizing of individual fan units, the use of glass filterers, air washers, and the proper amount of radiation to bring the air delivered to each room up to the required temperature.

Sanitary Maintenance of Old School Buildings

The problem of maintaining and providing greater sanitation in old buildings is far more difficult to solve. We have to deal with old, lifeless floors, heavily molded woodwork, plaster wainscots and, in some cases, paneled wood wainscots, cement floors, asphalt floors, and common brick surfaces. One can go on at length naming materials which we should never consider using. In most cases the material used was the best available at the time, but we find most old floors very porous and absorbent; the finely molded baseboard, door and window trim are dust collectors and difficult to clean; and the wainscots are easily kicked up, disfigured, and generally in need of repair. In many cases, patching must be carried on continually to maintain a reasonable appearance, and this results in high maintenance costs.

FLOORING

Most common among floors for classrooms and corridors in old buildings is the tried and proved maple flooring. The difficulty in maintaining wood floors is largely due to improper use of excessive amounts of water and strong cleaning powders. Water and strong alkali cleaners are harmful to this type of floor in that they reduce their life, leave them porous, open the joints, and allow for the gradual accumulation of dirt and disease-producing germs. Floors of this type can never be made perfectly clean and sanitary, but they can be renewed and brought back to a suitable and generally satisfactory surface by, first, sanding to obtain a new working surface; second, treating this surface with an impregnating preservative floor treatment to seal the pore structure of the wood; third, using one of the recognized brands of floor coating as a top dressing; and fourth, by not mopping the floor with hot water and strong alkali, but instead sweeping it with sweeping compound and renewing the top dressing as needed to preserve the surface. Several materials are now available which allow for maintenance of this type, and they are entirely satisfactory and maintain fine finishes.

Cement and asphalt types of flooring are generally very porous and therefore not sanitary. Most of these problem floors are in basement toilets and shower rooms. Where they exist and have reached the point of retaining dirt and odors, the most satisfactory way to remedy this condition is to resurface them with a well-constructed terrazzo or tile properly treated to seal the pores

NEW TYPE OF CORRIDOR TREATMENT, DETROIT SCHOOLS

with a recognized impregnating floor treatment. Otherwise, the time-worn method of good hot water, scrubbing, and killing odors with chloride disinfectant, is probably the most satisfactory.

In some cases, floor hardeners may be used on dusty cement floors, and will greatly help the janitorial problem of cleaning. Floor hardeners may be obtained in colorless liquid and also in color.

WAINSCOTS—WALLS—CEILINGS

Very little can be accomplished in treating wainscots, walls, and ceilings by reconstructing the interior of the building. Owing to excessive costs, this possibility is remote.

In the matter of wood trim, it is advisable to use high type varnishes or enameled wood surfaces. It is advisable to paint plaster walls and ceilings with the best grades of washable wall paint. If calcimine has been used, it is essential to remove this surface before new finishes are applied, to prevent flaking.

In general, the sanitation of old structures depends largely on the proper use of floor finishes, paints, and soap and water.

PLUMBING FIXTURES

Toilet facilities in old buildings require the continual attention of attendants to maintain really sanitary conditions. Even with the best attention, it is difficult to keep old lavatories, toilet fixtures, and even trough urinals, in order. These rooms should be equipped, as in new buildings, with exhaust fans, and all fixtures should be cleaned each day to obtain proper air conditions. Where obsolete and faulty types of equipment remain, steps should be taken to replace them with equipment discussed in the first part of this article.

FOR ADDITIONAL REFERENCE

Previous editions of the American School and University* contained the following articles in the field of school and university operation and maintenance:

IN THE 1933-1934 EDITION

University and College Accounting and Reporting
By Lloyd Morey, Comptroller and Professor of Accountancy, University of Illinois

The Organization of a Department for the Maintenance and Operation of Public School Buildings
By George F. Womrath, Assistant Superintendent of Schools, in Charge of Business Affairs, Minneapolis, Minn.

Uniform Regulations for School Janitors
By T. C. Holy, Bureau of Educational Research, Ohio State University

School Warehouse Revolving Funds

Fire Insurance Protection and Costs for Public School Properties
By H. C. Roberts, Chairman, Committee on Insurance, National Association of Public School Business Officials

IN THE 1935 EDITION

Taking the School Inventory, and Accounting for School Supplies in Small Schools
By F. E. Henzlik, University of Nebraska

Economy in Use of Janitor Supplies and Equipment
By H. H. Linn, Business Manager, Public Schools, Muskegon, Mich.

The Use of Color in the Remodeling and Renovating of School Buildings
By T. Merrill Prentice, Adams & Prentice, Architects, New York

The Model Trend in School Construction
By Reginald E. Marsh, Tooker & Marsh, Architects, New York

Self-Inspection of Buildings for Fire Inspection
By T. Alfred Fleming, Supervisor, Conservation Department, National Board of Fire Underwriters

* Copies available at $2.50 each.

The Summer Renovation Program

BY J. L. GLEASON

CLERK OF SCHOOL DISTRICT NO. 4, LIVINGSTON, MONTANA

WHEN the bells have ceased to ring and the hubbub in the corridors has quieted, the school executive must turn to planning the renovation and repair program.

The Board of Trustees, or the responsible committee or officer, should make a thorough inspection of all property at the close of the school year. In the meantime, the janitors and principals should jot down various things that have come to their attention during the year for consideration at the time of inspection. A list of all the things the executive would like to do should be made. A number of these will doubtless be of passing importance or be hard to justify at the time, but such a list is invaluable in making the plan. Some of the projects will necessarily have to be held in abeyance for several years while the more important ones are completed, but the list should be kept intact, adding to it as projects come into view.

Grouping the Work

Projects can be grouped by buildings. If the budget for repairs and alterations is sufficient, and the condition of the buildings is such as will demand it, more than one building can be thoroughly renovated each year. Otherwise, take one building at a time and complete all important projects of permanent worth during a summer period. Minor repairs can be made on and in other buildings until they are placed next in order for a complete overhauling.

Under certain conditions, grouping the work by projects instead of by buildings may be more satisfactory. If the floors in several buildings need replacing or refinishing, it may be economical to complete all of that work at once because of more advantageous labor or price considerations.

Once the plan of action and approximate costs are determined—which must be consistent with a reasonable budget demand—stick to it, and in the course of a few years, the buildings, playgrounds, and equipment will be giving better service to the children of the community, be more sanitary, less expensive to operate, and a delight to the patrons.

Renewing or Replacing Floors

How about those floors? Oiling has long been a matter of habit, but the very attributes of an oiled floor, such as holding down the dust, make for dark, unsightly, and decidedly unclean surfaces.

If possible, plan to replace old fir flooring with clear maple laid on top of the old flooring. If the surface is wavy and crooked, it will be necessary to remove the old floor to level up the subfloor before laying the new lumber. A good sanding job done by a competent man, two coats of a good floor seal, and you will have rooms that are light, sanitary and easily kept clean.

Old maple floors which have been oiled can be made like new by sanding and sealing. In the spring of 1935 we purchased a new floor sander. With this machine, operated by one of the janitors, we sanded 13,270 square feet of old, oiled maple, and 3,264 square feet of newly laid maple, at a total cost of $.017 per square foot, figuring janitor's time, sandpaper, and depreciation on machine. Compare this with a cost of $.03 per square foot for sanding 3,672 square feet of gymnasium floor the previous year by a private individual. As far as our experience here is concerned, oiling will be a thing of the past as fast as we can make it so.

Old fir floors which are not too badly worn or splintered can be renewed by sanding and refinishing. Fir which has been oiled for any length of time is generally soaked to considerable depth, and the sanding process will not remove all old oil without cutting too deeply.

When planning and purchasing for the summer work, beware of the salesman who will give a

Courtesy of The Porter-Cable Machine Co., Syracuse, N. Y.
SANDING MACHINE USED FOR FLOOR RENOVATION

portable sanding machine free of charge with an order for floor seal or oil, or other products. Cases have come to my attention where the executive could have purchased equal materials and the machine separately at a total price under that paid for the materials alone where the sander was thrown in.

We use trisodium phosphate for practically all cleaning. It can be purchased under its own name from reputable supply houses at 4 to 6 cents per pound in barrels. It is also available at stores under numerous brand-names in neat packages at prices up to 50 cents per pound. Whiting (ground chalk), mixed with a little trisodium and placed in sifter-top canisters, makes a satisfactory substitute for the more expensive scouring powders and cleaners.

The walls and ceilings can be calcimined or painted. Painted walls will reflect light better, and are easier to keep clean. Successive coats of calcimine will eventually have to be scraped or washed off, but the latter is cheaper to apply and may be better for some districts.

Insulating—Weatherstripping

Have you ever thought of insulating the ceiling of the top floor? Previous to insulating one of the local buildings we noted a difference of some twelve degrees between the temperatures of the first and second floors. The next year after insulating, the difference was never more than two degrees. Besides the resulting comfort to children and teachers, the fuel saving in that one building amounted to approximately 30 per cent during a winter of higher degree-day deficiency. We insulated with a loose-fill material manufactured from a micaceous rock, expanded by firing, then ground and screened. It is lighter than cork and an excellent non-conductor of heat. The total cost of insulating each of two buildings was $.067 per square foot, 2½ inches thick. Our present plan calls for eventual insulating of all buildings.

JANITOR USING PORTABLE SANDER ON DESK-TOP IN ONE OF THE LIVINGSTON SCHOOLS

If the windows and doors of the buildings are not already weatherstripped, part of your plan should include this work, especially if the building is heated automatically. Properly applied weatherstrip, preferably the metal type, will do much toward keeping out troublesome drafts, and will help to hold the heat in the building during the night. Also, the intrusion of dirt around loosely hung windows and doors can be almost entirely eliminated.

Lighting—Sanitation

Check the schoolroom lighting. Have a representative of your electric light and power company determine the foot-candles of light at various points in the rooms, both during the day and at night. You will probably be surprised to find that the lighting facilities are inadequate to prevent serious eyestrain. A worth-while project for your plan would be complete modernizing of the lighting equipment to conform to known standards.

If the toilet rooms are equipped with sanitary facilities, are kept clean and well washed, there will be no need of high-priced disinfectants and highly odorous deodorants. The stench that has greeted my nostrils upon entering toilet rooms in some school buildings has immediately classed the school executive in my mind. Instead of trying to outdo the natural odors with blocks and sprays that usually smell worse, try keeping these rooms thoroughly and meticulously clean. The American Medical Association has informed me that a good deodorant and disinfectant for public buildings is plenty of hot water and soap.

Roofs—Drains—Heating Plant

Include in your plan necessary repairs to roofs and drains. These repairs are all too often of an emergency nature, and sometimes replastering must accompany the roof repairs. If you can imagine blocks of plaster ½-inch thick and weighing 40 to 50 pounds falling in a room full of children, you will not let the roofs leak.

Check the boilers and heating systems at least twice a year. Worn-out compressors, steam traps, thermostatic valves, radiator valves, hot air flues, etc., should be replaced as soon as possible. All soot and scale should be scraped off the outside

of the boiler shell and off other surfaces which transmit heat to the water. Soot is one of the best heat insulators known and can reduce the efficiency of a heating plant tremendously.

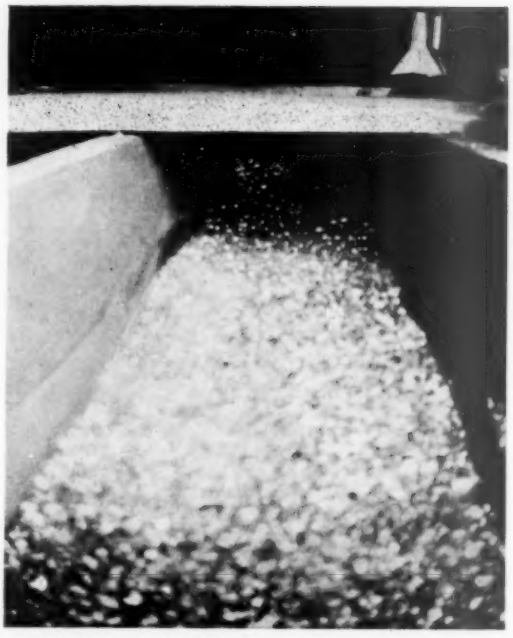
Valves—Leaks

Do the substitute janitors or beginners have trouble in locating valves? The answer is to tag the valves. We used white linen-like shipping tags numbered consecutively from one up. On each tag a brief description of the function of the valve was typewritten. The tags were coated with clear varnish and wired to the proper valves. Lists were then made, framed, and hung in the janitor's room or the boiler room, giving the valve number, its approximate location, and function. We have no trouble in finding valves of any kind.

Investigate the plumbing system for water leaks. Untold gallons of water will be wasted by leaky faucets, toilets, and flushing apparatus. If the water system is metered, test for leaks by shutting off all water outlets in the building and making two meter readings several days apart. Leaks in broken pipes that are out of sight in partitions or under floors can be determined by this method, and repairs made.

Renovating Desks and Other Equipment

To do good work, pupils and teachers should have usable equipment. Pupils' desks can be gone over, the top-woods, backs and seats sanded with one of several good portable sanders on the market, holes and cracks filled, and refinished. We have obtained good results by leaving shellac out of the program entirely and giving a first coat of good grade floor-seal thinned with turpentine or a recommended thinner over the stain coat, followed by one or two coats of the same material without thinning. Some years ago we had 600 desks renovated by a private concern. Each seat was boiled in a chemical bath to remove the old finish, allowed to dry, machine-sanded, and refinished. The cost was $1.50 per desk. The service rendered by these refinished desks has been very poor, and successive coats of varnish have not remedied the apparently poor foundation. Our experience would indicate that the chemical bath for removing old finish is not the best method.



LOOSE-LEAF INSULATION, 2½ INCHES DEEP, BETWEEN RAFTERS IN CEILING IN WEST SIDE SCHOOL, LIVINGSTON

Balky window shades and windows, map cases, globes, laboratory equipment, etc., can cause a teacher trouble that may detract from teaching efficiency. An accumulation of little things can also be expensive if not found and placed in good condition regularly.

PORTION OF PLAYGROUND AT LINCOLN SCHOOL, LIVINGSTON, SHOWING ONE OF TWO TENNIS COURTS TOPPED WITH ASPHALT AND ENCLOSED WITH CHAIN-LINK FENCING

Improving Safety Conditions

A month after school opened last fall, a giant-stride chain on which a child was playing broke, and in falling cut the child's head severely, necessitating a doctor's care. The laxity of the janitor in charge was responsible for this accident. This chain was worn to the breaking point and should have been discovered and renewed. Playground equipment can be extremely dangerous to pupils using it if it is not kept in good repair. The

summer period is the time for such work, not after some child has been injured. Include in your summer plan a systematic check of all athletic and playground equipment.

An opportunity often overlooked to improve safety conditions and save money is in fire prevention. Cleanliness, orderly storing of supplies, and placing fire extinguishers at strategic points, will result in less fire hazard and perhaps a saving in fire insurance premiums. Investigate the possibility of such premium reductions, and plan to take advantage of any obtainable.

Space will not allow giving details of various methods, reports and surveys used locally for the summer work. In seeking information relative to products which are efficient and low in cost, make use of service offered by the U. S. Bureau of Standards, U. S. Department of Agriculture, and Consumer's Research, Washington, N. J. The last named organization releases much valuable information to subscribers. It will surprise purchasers of supplies to learn the composition of some high-priced articles that can be purchased under true names at much lower prices.

Make your plan to cover a few years, and fit each year's program to the budget for such work. If you can't re-floor two rooms, do one at a time; at least plan it, start it, and push it. As fast as completed projects go off the top of the list, others will appear at the bottom.

DETERMINING THE REQUIRED MAN-POWER TO OPERATE A SCHOOL BUILDING

It is not always a simple matter to determine the number of employees needed to operate a school building, especially when the services of several individuals are required. In the first place, definite standards must be established for the various jobs that must be done, and the frequency of performance and the time needed for each job determined. Because so many variables enter into the problem, rules for determining the required number of employees for one building may not apply to another building. For example, it requires more labor to wash windows monthly than quarterly; it takes more time to set and wind portable wall clocks than to adjust the modern automatic clocks; it requires more time for a man to care for a high-pressure heating system than a low-pressure system; a large lawn requires more attention than a small one; a man with good tools and proper supplies can do his work more rapidly and with better results than if poor equipment and supplies are furnished him; and certain types of shops and special rooms require more time and attention than other classrooms. Dozens of variables could be added to this list, but these are sufficient to point out the fact that definite standards for quality of work and frequency and time of job performance must be established for each individual building before the required man-power can be determined on a reasonably scientific basis.

—Reprinted by permission from "Practical School Economics," by H. H. Linn, Assistant Superintendent in Charge of Business Affairs, Muskegon Public Schools, Muskegon, Mich. Published by Bureau of Publications, Teachers College, Columbia University. 1934.

Maintenance and Operation of a University Plant

A Few Elementary Comments

BY FREDERIC B. JOHNSON
YALE UNIVERSITY

THE problem of maintaining and operating the plant of a university has changed greatly within the last thirty or forty years, owing largely to the very great advance in the standard of student living. Compare, for example, the dormitory in which the writer lived as a student with the present-day dormitory generously provided with baths and other plumbing equipment and a modern heating system. The old-time dormitory housing fifty to sixty students had for plumbing fixtures two iron sinks and four water-closets (which any plumbing inspector of today would condemn in even the most primitive structure), and for its heating system small coal- or wood-burning stoves, owned by the students themselves. New buildings of fireproof and sanitary construction simplify the task of maintenance and operation, since fewer repairs are required than for buildings of older types. Moreover, when they are clean, they look clean. On the other hand, these newer buildings are more difficult to repair and to alter if necessary, and the problem of their upkeep is made more intricate by the fact that the apparatus they contain—plumbing, heating and ventilating—is more complicated.

It is probably a mistake for a man to attempt to generalize as to conditions outside his own limited field and experience. It should be understood, therefore, that this subject of plant management is being discussed on the basis of conditions found in one institution where the problems of coeducation are present to only a very limited extent. The institution in question has upwards of 5,000 students, and is subdivided into the following schools:

The College (male undergraduates only)
The School of Engineering (male undergraduates only)
The Scientific School (male undergraduates only)
The Graduate School (men and women)
The Law School (men and a very few women)
The Medical School (men and a very few women)
The Forestry School (men only)
The Music School (men and women)
The School of Fine Arts, including Drawing, Painting, Sculpture, Architecture and Drama (men and women)
The Divinity School (men and a few women)
The Nursing School (women only)

The dormitories house approximately 3,500 men, and one or two small houses are occupied by the women in lieu of regular dormitories.

The organization responsible for maintenance and operation of buildings and grounds is controlled and directed by the Comptroller of the University, to whom the General Manager of the Service Bureaus reports and is responsible. The General Manager is aided by an Assistant Manager, and by several assistants, junior in rank. The Assistant Manager is a graduate in mechanical engineering, and the others, some of them graduates in construction engineering, are men of experience in construction, gardening, etc.

If we can distinguish between operation and maintenance, the task from the operating standpoint, leaving out of account such questions as who shall allocate space and arrange schedules of use in recitation room buildings, and who shall assign dormitory rooms to occupants, is to keep the buildings clean, lighted and ventilated, and from the maintenance standpoint to keep them in good repair. Since this discussion is limited to the operation and maintenance of a physical plant, many duties of the University Service Bureaus are intentionally omitted. However, in addition to the obvious sorts of work suggested above, responsibility for operation and maintenance involves:

a. Scrutinizing of plans and specifications for all new structures to make sure that they conform to or improve standards previously established for various purposes and embody types of construction, arrangement of space, materials and equipment likely to be durable and convenient to use and economical to maintain and service.

b. The periodic inspection of all structures and the contained equipment, the inspectors' reports serving as a basis for initiating repairs, including redecorating, as well as external painting.

c. Special inspection from the fire hazard standpoint to make sure that all exits are clear, all waste and rubbish promptly removed, all fire extinguishers and other fire-fighting apparatus in order.

d. Periodic surprise inspections of students' quarters to prevent or discover tampering with wiring and electrical equipment and wilfull or careless damage done by students. Repairs when completed are charged to the student's account, a measure which has very greatly decreased the wanton and even careless damage and defacement of property.

e. Very frequent inspection and servicing, including cleaning and oiling, of motors, elevators, refrigerating equipment, fans, reducing valves, steam traps, etc., to prevent, instead of having to cure, failures to function.

All the work of this maintenance inspection is handled by assistants in the department, aided

by a fire protection inspector and men skilled in the various mechanical and structural trades. These workmen are selected from a maintenance group of mechanics, which consists of carpenters, masons, plumbers, steamfitters, electricians, tinsmiths, painters and laborers. Men from the several trades work under foremen and under the supervision and control of the General Manager, the Assistant Manager and their several primary assistants.

The janitor service, except for a few buildings devoted to special purposes, operates under the direction of a superintendent who is responsible to the General Manager and Assistant General Manager. The Superintendent of Janitors has to assist him an Assistant Superintendent, a corps of five inspectors, a clerk, and a crew of janitors and janitresses. Their obvious duty is to keep the buildings clean at all times and in readiness for the use for which they are intended. The Superintendent, his Assistant, and inspectors are constantly examining conditions, and the inspectors are required not merely to report unsatisfactory conditions found, which they must do, but to instruct the janitors and janitresses how to do their work efficiently, both as to quality of result and speed of accomplishment. In reporting on the work of the janitors, the inspectors use Forms *A* and *B*. If conditions are found to be satisfactory, a check mark is placed in column "G"; if unsatisfactory or bad, a check mark is placed in column "B." Comparison of current reports on an individual janitor or janitress with those made previously should show a constant improvement. If there is no indication of improvement or if the reports are worse, they serve as a basis for definite reprimand, or for dismissal in flagrant cases. Every one in this department is expected to report emergency trouble and to be on the watch for any condition requiring attention by the maintenance department, and reports are made systematically through the Superintendent's office, thus securing immediate remedy of conditions which otherwise might remain unobserved until maintenance inspection discovered them.

The Grounds Service, including care of lawns, shrubs, vines, sweeping of walks, snow removal, etc., is also directed by the General Manager and Assistant General Manager acting through a foreman in charge of a crew of gardeners and laborers.

Certain buildings devoted to the use of special departments are of such size and intricacy as to require in each a superintendent; for example, the University Library, the Graduate and Law Buildings, the Gallery of Fine Arts, the Gymnasium, the Medical School, the Natural History Museum, the laboratories of Biology, Physics and Chemistry. This makes it possible for janitors to function also as technicians in these special subjects or as custodians of collections when buildings are open to the public. The directors of the departments using these buildings exercise a good

Bldg.			Entry	Floor	Date		
Jan.					Time		
	G	B		G	B	G	B
STAIRS & HALLS			BATH ROOM				
Floors			Toilet Seats			Shower Baths		
Stairs			Toilet Bowls			Floors		
Walls			Toilet Bases			Walls		
Ltg. Fixtures			Wash Bowls			Windows		
Windows			Soap Trays			Ltg. Fixtures		
Remarks								
			Inspected by					

Bldg.			Room No.			Date	Hour	
Jan.			Inspector					
	G	B		G	B		G	B
Beds			Furniture			Walls		
Closets			Fireplace			Windows		
Soiled Linen			Radiators			Window Seats		
Ltg. Globes			Rugs			Woodwork		
Floors			Waste Baskets					
Remarks								

3 X 5-INCH SLIPS USED BY INSPECTORS IN THE JANITOR SERVICE

Form at top covers the work of men; the other form the work of women

deal of control of the activities of the men assigned to them in the janitor service. However, all these buildings are subject to the Service Bureaus' maintenance inspection and maintenance service and janitor service inspection, so that standards of repair and cleanliness are constantly maintained.

The athletic grounds and buildings are maintained and operated as a quite separate unit.

Except for the purchase of a part of the electric current used, both steam for heat and electricity for lighting and power are supplied from central plants connected with the buildings through tunnels and ducts. This does not apply in the case of a few isolated buildings which have their own heating boilers. The maintenance department, steamfitting and electrical trades primarily, are responsible for the care and operation of all equipment outside the power houses by which steam and electricity are utilized, although in some buildings the local janitors are responsible for the operation of ventilating apparatus to conform to schedules of use. The heating system is not only economical and efficient, but also simplifies to a marked degree the work of the janitor service in that it eliminates the need for handling coal, ashes, etc.

Form C, on a 4" x 6" card (not reproduced), is used primarily for annual room-to-room inspection of dormitories; also for reporting on the condition of public rooms, bathrooms and recitation rooms. It states name of building and num-

ber of room; also name of carpenter and of mason, and lists the following items inspected: fireplaces; fire screens; painting; washing; glazing; curtains and shades; electrical; plumbing; occupant charges.

Form D, also on a 4" x 6" card (not reproduced), is of most value in connection with properties rented for mercantile or other occupancy, although used in examination of hazards in buildings occupied by the University. It reports fire hazards in connection with the following in any given building: rubbish cans; oil waste cans; oil and waste storage; metal lockers; heating equipment; smoke pipes; gas plates and ovens; chimneys; gasoline and benzine storage; waste paper; storage, attic and basement; lighting; fire protection. Name of inspector and date of inspection are of course given.

Forms E and F (not reproduced), are kept in an 8½" x 11" loose-leaf notebook, and are used for annual inspections of structures, and for any necessary interim inspections. Form E covers joints and condition of brick and stone work in walls; in cornices; in copings—including flashings running through; parapets—including leaks; windows—calking, sills, jambs, lintels; chimneys—safe or unsafe joints; paint—trim, doors, windows—metal or wood.

Form F covers the annual roof inspection, including roof skylights, flashings, gutters, leaders, and other outside metal work; and records, in connection with repair work, the estimated cost of labor and material, the actual cost, the job number, and the dates of its issue and its completion.

Throughout the organization of the University Service Bureaus we have adhered to the principle that with the assignment of a responsibility sufficient authority should be given for the carrying-out of all that the responsibility involves. Naturally this does not mean that subordinates have a free hand to initiate expenditures, to increase or decrease personnel, or to change methods or substitute different supplies and tools for those approved by the General Manager.

While the possibilities of reward for exceptional ability and skill are not many, a very definite effort is made to promote the best men to positions of increased responsibility and compensation whenever possible. There is, unfortunately, no pension system, but each person in service six months or longer shares in a group insurance, the cost of which is borne entirely by the University. Under the conditions obtaining, and except for seasonal variations, the group is essentially stable. Long service instead of rapid labor turnover is characteristic.

It would hardly be possible to attach too much importance to the subject of inspection. Whatever success the University Service Bureaus have attained has been largely dependent on the efficiency of inspection and the prompt and efficient following-up of all unsatisfactory conditions revealed by the inspection.

What Price Neglect of the Heating Plant?

BY ALFRED KELLOGG
CONSULTING ENGINEER, BOSTON, MASS.

SCARCELY a day passes that the vital necessity of plant rehabilitation is not brought home in some way to owners and managers of industrial organizations, not excepting also, in some degree, school authorities. It is well that attention be particularly directed to the existing physical condition of the heating plants in school buildings. Practically all school heating plants have suffered in many ways on account of neglect, emphasized by five consecutive years of business depression, necessitating retrenchment and lack of municipal appropriations for upkeep. The question of the run-down condition of school buildings and their heating and plumbing installations is one broad enough to merit the careful scrutiny of school authorities.

Retrenchment in expenditures for plant upkeep is to be expected during such periods as we have been passing through, but the effort to economize is often carried too far, and in too many instances the cost of bringing a run-down plant back to normal operating efficiency more than offsets any financial savings that have been effected since 1930. Just now, the better feeling most of us have regarding the future of business, and the reasonable assurance that the worst has passed, lead us to the consideration of what should be done at this time to meet the evident trend toward normal conditions.

New Equipment

Since 1930, great advances have been made in the design of heating equipment, leading to higher efficiency in operation and attendant fuel savings; also to more accurate control of room temperatures, with consequently greater comfort.

New designs in mechanical stokers for both bituminous and anthracite coals tend to reduce fuel consumption as much as 15 to 20 per cent over hand firing, and when properly installed will automatically maintain the general building temperature within quite reasonable limits. Their use also leaves the janitor more time for other necessary duties, since the stokers need to be replenished with coal only at intervals of several hours.

Where fuel oil is available at prices comparable with coal, most satisfactory results in the use of such fuel may be expected if the burner installation has been properly made. Natural gas should prove the ideal fuel for schools where it is available. Artificial gas, however, is not generally to be obtained at a price sufficiently low to warrant consideration as heating fuel in schools. There will be entire freedom from the laborious handling of coal and the removal of ashes, with the attendant dust and dirt, where oil or gas is burned.

The remarkably rapid development of temperature-control equipment in the last five years also warrants careful consideration by school authorities. In some makes these devices are operated by compressed air, and in others from existing lighting circuits in the building. They may be applied to existing radiators and unit ventilators in classrooms and other spaces in buildings where, unfortunately for both comfort and fuel economy, equipment is left to inefficient hand control or no control whatever, with resultant room temperatures ranging up to 90° in many instances, with the windows wide open at the same time.

Automatic temperature-control devices are imperatively indicated where unit ventilators are to be installed, if satisfactory results are expected. Where the central fan system is in use for providing air for ventilation, automatic control of the air temperature will probably have been provided when the installation was made.

Rehabilitation of Existing Plants

In many schools, however, proper rehabilitation will consist largely in putting the existing heating systems in good mechanical order for the approaching fall term.

Boilers, if built of steel, need to be carefully examined by a competent inspector conversant with boiler design and construction. The tubes should be thoroughly cleaned, on both outer and inner surfaces. All soot deposits and scale should be removed, leaving the tube and other surfaces in a condition for maximum steam making. Leaky tubes should be replaced with new ones, and the boiler shell and riveting should also receive careful scrutiny.

If boilers are brick-set, the joints in the brickwork should be looked over for air leaks into the setting, which tend to lower the furnace temperature, with consequent loss of efficiency and waste of fuel.

To ascertain if air is leaking inward, a lighted candle should be passed along close to the joints in the brickwork. If there is leakage at any joint, or around pipe openings and door frames in the brickwork, the flame will be drawn inward, owing to the chimney draft. The remedy is to plaster over with a trowel the entire brick surface with a compound of asbestos and coal tar, which may be bought at many supply houses. It is both cheap and durable, and will save fuel.

In general, the same careful examination should be given boilers of cast iron construction. Nipples and pipe connections should be examined for corrosion and leaks, and circulation should be maintained within and without the boiler by the removal of rust and dirt from the piping system, which is certain to accumulate in the return connections at the boilers.

If the boilers are hand-fired, the grates may have to be renewed, otherwise there will be a waste of fuel. Where mechanical stokers or oil burners are in use, they should be overhauled by a competent service man recommended by or supplied by the manufacturer. Care in these matters will nearly always pay worth-while dividends.

The system of piping from the boilers through the building should be examined for pockets and leaks, and these defects remedied. Radiator valves and traps should be put in order, the valves repacked if leaky, and the traps opened up and the accumulated dirt from the radiators and piping removed, otherwise they will leak and cause trouble. Do this every year.

Where a temperature-control system is already in use, the manufacturer should send a service man to put it in order. This service should be provided every year at the beginning of the fall term, after the heating system has been started up.

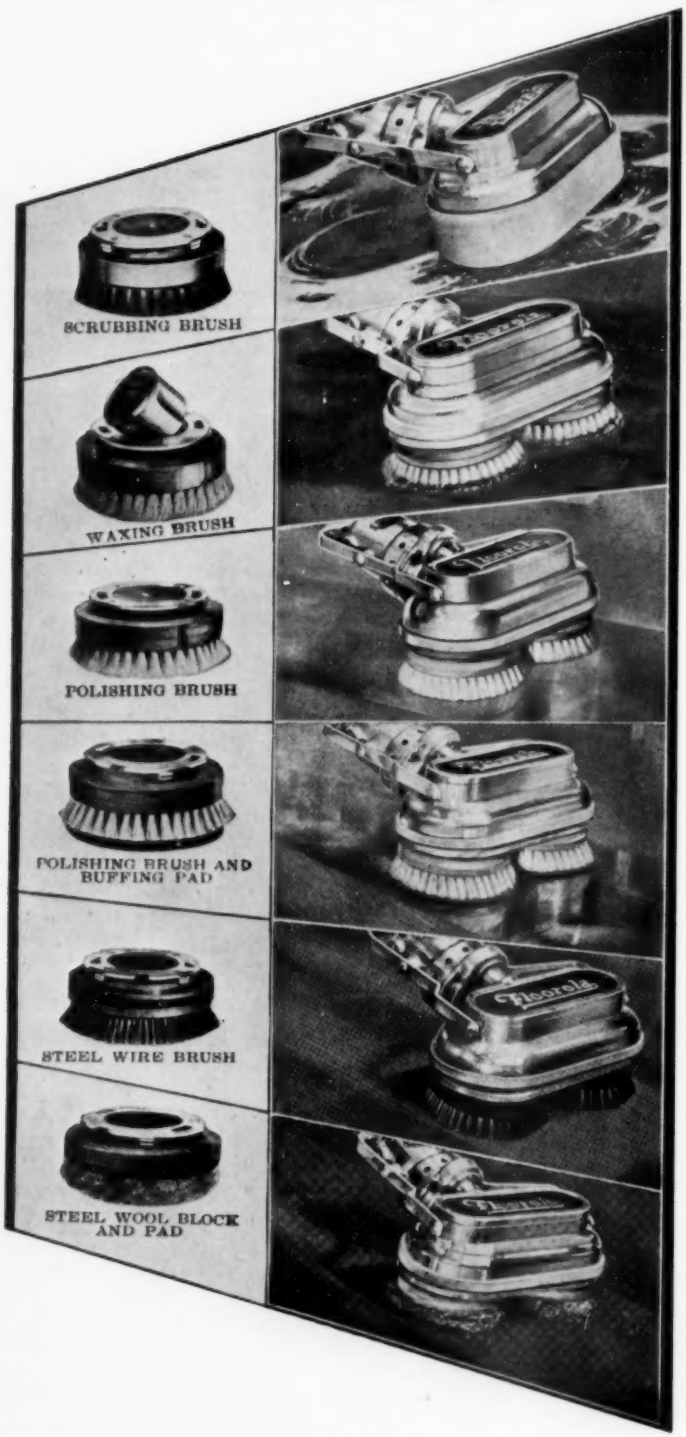
Plumbing fixtures should be overhauled—valves repaired and leaks in piping remedied, thus saving in water bills. If the water pressure exceeds 65 to 70 pounds, a pressure regulator should be installed, for high water pressures destroy valves and other parts and cause joints to leak.

Electric batteries (where in use) will probably be found to have run down, and should be recharged and replenished with pure water. The clock system may need the attention of the manufacturer's service man.

Many of the foregoing suggestions may seem to be commonplace, but five years of accumulated neglect inevitably means accumulated waste.

FLOOROLA PRODUCTS INC.

York, Pa.



WHAT Floorola DOES

SCRUBS

Floorola is ideal for all scrubbing jobs. It will clean tile, marble, cement and rubber floors as they have never been cleaned before.

WAXES

Floorola applies the Floorola-Wax automatically from containers within the distributing brushes, thence to the floor. With Floorola, wax is properly applied—in thin, even coats.

POLISHES

After the application of Floorola-Wax has dried on the floor, it is briskly polished with the polishing brushes. In a comparatively short time the desired lustre appears—you have beautiful floors—floors that will remain beautiful with a minimum of care.

BUFFS

Should you desire a higher lustre, place the buffing pads beneath the polishing brushes. A few minutes' buffing will quickly and easily produce a beautiful mellow lustre.

RENEWS

If floor is dirty, give it a wax scrub. This is accomplished by applying a heavy coat of Floorola-Wax and scrubbing with fine steel wool while the wax is still wet. An additional coat of Floorola-Wax will give you the superlative Floorola finish.

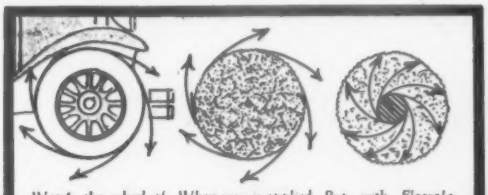
HOW TO MAINTAIN YOUR SCHOOL FLOORS IN BEST CONDITION AT LEAST COST

The Floorola method will do this for you!

Wax is the best answer to the problem of finding a floor treatment that will be economical, practical, easy to apply, and one that will preserve and accentuate the beauty of your floors. The reason that wax has not been used more generally in the past is because there never has been a simple, easy, foolproof, economical and efficient way of applying and polishing the wax until the development of the Floorola method.

Economy: $2.50 worth of Floorola wax applied the Floorola way will cover approximately 2400 to 3600 square feet of floor; whereas sufficient loose wax, either paste or liquid, applied by any other method to cover the same area, would cost between $5.00 and $7.00.

The Floorola floor machine is manufactured in two models, illustrated on this page: Model A, 3-brush, price $137.50, and Model C, 2-brush, $89.50—each with complete standard equipment.

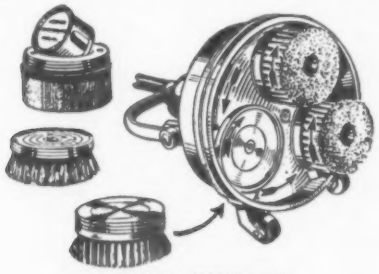


Watch the wheel of an automobile on a wet pavement . . . see how the rotating tire throws the water away from it.

When wax is applied to the floor by hand, or with external devices in similar manner the brushes cast most of the wax aside as soon as they come in contact with it—a deep, penetrating finish is impossible!

But with Floorola, the wax is fed from within the brushes themselves . . the wax is always where it is needed—beneath the brushes! This vital feature is one of the reasons for Floorola superiority

An institutional discount of 15% off these prices is allowed to schools and colleges



BOTTOM VIEW OF MODEL "A"

Showing clockwise and counter-clockwise motion of brushes. This action effects a perfect balanced machine, ease of operation, no creeping to one side or the other, and produces even, uniform wax distribution

MODEL "A" FLOOROLA

Type—3 rotating brushes on revolving disc.
Brush — 800 r.p.m.
Weight — 27 pounds.
Motor — Universal, a.c. or d.c., 110-volt, ⅛-hp., 60-cycle, single-phase.
Diameter—11".
Standard equipment includes 3 waxing brushes, 3 polishing brushes, 3 scrubbing brushes with apron and 6 cans of Floorola-Wax

Write for a copy of our illustrated booklet

MODEL "C" FLOOROLA

Type — 2 brushes, revolving in opposite directions.
Brush—600 r.p.m.
Weight — 18 pounds.
Motor—Universal, a.c. or d.c., 110-volt, ⅛-hp., 60-cycle, single-phase.
Standard equipment: 1 set each waxing and polishing brushes, buffing pads; 4 cans of Floorola-Wax

THE HILLYARD CHEMICAL CO.

St. Joseph, Missouri

A National Maintenance Organization. . . Twenty-eight Years Continuous Service

CLEANERS

SUPER-SHINE-ALL is not a Trade-Mark Reg. soap, but a Neutral Liquid Chemical Cleaner for all types of floors, also painted and varnished surfaces. It cleans, polishes and preserves in one operation. It possesses 100% active cleaning units.

BRITEN-ZIT is the pioneer and nationally Trade-Mark Reg. recognized leader of all heavy bodied liquid cleaners, costs less and is more economical to use.

RENOVATOR. Hopelessly black and gummy oil soaked floors can be brought out to look like new with Hillyard's Renovator.

BLACKBOARD CLEANER chemically removes chalk, dust and foreign substances without injury to the surface.

WOOD FLOOR TREATMENT

HILLYARD'S WOOD PRIMER definitely seals and preserves, insures an ideal surface for the application of any desired finish or treatment.

HIL-SEAL for Class Room Floors or hallways. One coat of **HIL-SEAL** and two coats of Hil-Brite Self-Polishing Wax produces an ideal floor for school room or hallway.

HIL-GLO Finish, light in color and of medium body, is excellent for new work or for renewing old floors in gymnasiums, or for domestic use.

SUPER-SPECIAL GYM FINISH produces a non-slippery, durable and sanitary floor, easy to maintain. Withstands hard and constant wear, insures a perfect non-slippery surface which will not rubber burn. Adapted for new floors.

AUTOMATIC SWEEPING BRUSH leaves a clean lustrous surface, absorbs the dust, saves labor. The wicks are detachable and washable. Sizes 12, 18, 36 inches.

FLOOR MAINTENANCE

HIL-BRITE Self-Polishing Water Emulsion Trade-Mark Reg. Wax, dries bright without rubbing or polishing. Saves time, cuts your waxing cost in half.

HIL-TONE is a Floor Dressing, having a wax content which cleans and forms a protective film on finished floors.

HIL-MIST sprayed lightly on the floor cov- T.-M. Reg. ers approximately 3,000 sq. ft. per gal. Is economical to use, has wonderful spreading qualities.

HIL-KOTE is a wax treatment for linoleum, T.-M. Reg. cork and wood floors. Will cover more space than wax and wears longer, is easy to maintain.

TREATMENTS

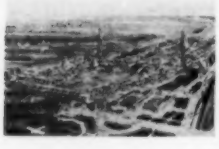
ONEX-SEAL gives positive protection and re- T.-M. Reg. stores the original attractive finish to Terrazzo, Tile and cement. Produces a waterproof, sealed surface. Approved and recommended by Natl. Terrazzo and Mosaic Ass'n.

TERRAZZINE seals the moisture into the Trade-Mark Reg. floor, brings out the true rich colors of the marble chips and cement and adds a permanent sheen. Approved and recommended by Natl. Terrazzo and Mosaic Ass'n.

WINDO-CLEAN dissolves grime and removes dirt, eliminates buckets, sponges, water. Makes glass sparkle.

HIL-VAR, Hillyard's Surface Re-newer brings out the hidden beauty of all woodwork. Applied with brush or cloth. Dries in 45 min.

HI-KO—a Sodium Hypochlorite solution, a T.-M. Reg. preventative of Athlete's Foot. Its regular use insures against the spread of communicable diseases.



Hillyard Products Used Exclusively Two Years, "Century of Progress"

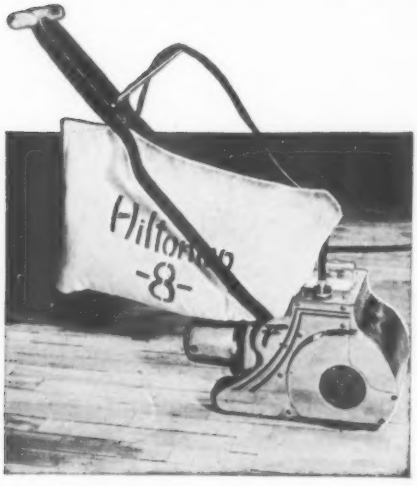
Send for Our CATALOG, 48 Pages of Valuable Information on Floor Maintenance and Sanitation

SWEETS

THE AMERICAN SCHOOL AND UNIVERSITY

MILLIONS OF DOLLARS SAVED

RECLAIMING AND REJUVENATING OLD FLOORS



Speed combined with light weight has long been desired by Educational, Public and Private Institutions. The "Hiltonian" "8" can be carried with one hand, truly a one-man machine, and is the answer to present day demand for efficiency and economy.

Hillyard's

HILTONIAN "8"

FLOOR SANDING MACHINE

With its ease of operation and handling, the "Hiltonian" "8" stands alone in the field of high production sanders. Although light in weight, nothing is sacrificed in cutting efficiency, as the 1 H. P. Heavy Duty Motor, 8″ Sanding Drum travels at a surface speed of 3,534 feet per minute.

The Drum is dynamically balanced and with the "Hiltonian" improved spiral wrap of sandpaper, the quality of work cannot be surpassed.

There is only one fair test of Floor Sander Production—the weight of material removed in a given length of time. Compare this "Hiltonian" with all others! You will find 20% more production with 40% less investment, 60% less weight, 33⅓% less power.

. . . . HILTONIAN Electric . . . .

SCRUBBING *and* WAXING Machines

Hiltonian Electric Scrubbing and Waxing machines are sturdily built and quietly operated. It takes but little effort to operate any of these five machines, due to their perfect balance.

These machines co-ordinate speed, power and weight to give the utmost in all around service. The many years they have been in service definitely proves their sturdiness and efficiency.

THE LAST WORD IN MODERN FLOOR MAINTENANCE MACHINES

J. I. HOLCOMB MFG. COMPANY

Draper and Van Buren Streets

Indianapolis, Ind.

EASTERN OFFICE: 437 11th Ave., New York, N. Y.

Products

Cleaning Brushes and Cleaning Chemicals—Floor Brushes, Dusters, Scrubs, Toilet Brushes, Cleansers, Deodorants, Disinfectants, Floor Finishes, Polishes, and Toilet Soaps.

The J. I. Holcomb Manufacturing Company is the largest manufacturer and distributor of cleaning brushes and cleaning chemicals. For forty years thousands of customers have been coming to "Cleaning Headquarters" with both their usual and unusual cleaning problems.

Almost 70 per cent of the schools of the country are using Holcomb Cleaning Tools.

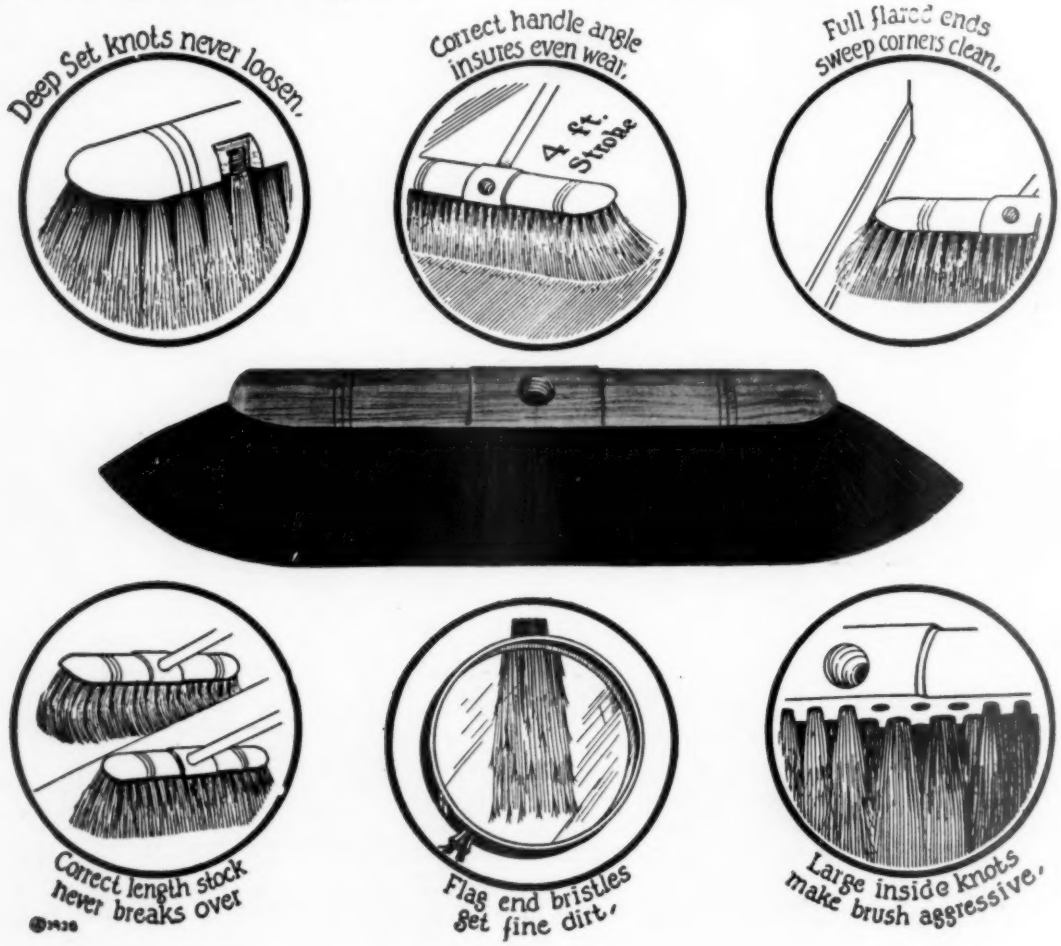
Your Cleaning Costs

"Speeding-up-the-job" is the first thing built into the Holcomb line.

As the labor cost is approximately twenty times the material cost, a 10% saving on the labor makes a profit equal to twice the cost of the material.

Holcomb Floor Brushes

During four to five months of winter, sweeping-time, after the classrooms are vacated, is limited. Holcomb Floor Brushes do the maximum sweeping per stroke with the minimum of labor. "Correct construction cuts cleaning costs"—by speeding up the job.


Deep Set knots never loosen.
Correct handle angle insures even wear.
4 ft. Stroke
Full flared ends sweep corners clean.
Correct length stock never breaks over
Flag end bristles get fine dirt.
Large inside knots make brush aggressive.

THE AMERICAN SCHOOL AND UNIVERSITY

You Spend $950.00 for Labor

. . . for each $50.00 worth of ordinary cleaning materials that you PURCHASE

The selection of the "correct" cleaning material is of major importance. This is due to the intimate relationship between material costs and labor costs.

When you purchase a dozen floor brushes do you stop and consider for what you have contracted? The big item is the one ahead—the paying for the thousands of labor hours until the floor brushes are worn out.

You have contracted to put twelve men at the handle end of those dozen floor brushes at say 40¢ an hour—this means $4.80 an hour paid out of the cash drawer for labor for every hour until the dozen brushes are worn out.

Isn't it obvious that there is only one consideration to govern what you buy in the way of cleaning tools and cleaning materials—selecting that tool or that material which will make possible the doing of the given job in less time.

Boiled down this means—that for every $50.00 spent for **ordinary** cleaning material throughout the school year, you obligate yourself to spend at least $950.00 for labor in using the material. That is a ratio of 19 to 1.

EVERY CLEANING TOOL BUILT BY HOLCOMB IS DESIGNED TO REDUCE THAT $950.00 LABOR ITEM

A reduction of 10% in your material cost is $5.00. A reduction of 10% in your labor hours is $95.00. Reducing the labor hour cost is the true gauge of the value of one article of cleaning merchandise over an other.

The Holcomb line is built to do a given job in THE LEAST NUMBER OF LABOR HOURS.

THE CORRECT CLEANING TOOL IS THAT "CLEANING TOOL" WHICH DOES THE JOB FOR WHICH IT IS BUILT IN THE LEAST NUMBER OF LABOR HOURS.

MIDLAND CHEMICAL LABORATORIES

INCORPORATED

Dubuque, Iowa

FLOOR MAINTENANCE MATERIALS FOR CLEANING AND FINISHING FLOORS AND RE-CONDITIONING OLD FLOORS

Gymloh

The Special "Gym"
Bakelite Finish
Economical to use
Durable
Easy to Clean
Non-Slippery
Will Not Rubber-Burn

Lohseal

Approved by National Maple Flooring Manufacturers Association

Permanently seals the pores of a floor preventing the absorption by the floor of anything dropped upon it and also keeps dirt from being ground into it. Lohseal conditions a floor for other finishes.

Midland

SCRUBBING AND POLISHING MACHINE

Built for Service
Simple Sturdy Construction
Economical Floor Maintenance

Master Finish

FOR CLASSROOM FLOORS

Not a varnish, shellac or lacquer . . . a distinct laboratory product, a Bakelite Finish. Produces a lustrous finish that is extremely hard and durable.

Wax

FOR ALL TYPES OF FLOORS, Liquids, Semi-Liquids and Paste Waxes

THE AMERICAN SCHOOL AND UNIVERSITY

Basic LIQUID SOAP

A high grade undiluted hand soap manufactured from the purest raw materials. Uniform —Pure—Mild.

Tileoleum

SASSAFRAS

For scrubbing all types of floors, floor coverings, painted surfaces. Rinses one hundred per cent.

Athaloh

WILL PREVENT THE SPREAD OF ATHLETE'S FOOT!

A 25% solution of Athaloh Disinfectant will kill the fungus Trichophyton (which causes this infection) in thirty seconds. For the Swimmer and Athlete, a foot bath at least ankle deep with an exposure of at least one minute in an Athaloh Disinfectant solution will prevent Athlete's Foot.

Germoluptus

An effective Germicide and Disinfectant which is used in Liquid Soap for disinfecting the hands, for spraying wrestling mats, for disinfecting urinals and toilets and for treating Athlete's Foot Infection. Non - Poisonous, Stainless. A very pleasant odor.

TOILET SUPPLIES

Shiloh

Porcelain Cleaner

For cleaning porcelain and enamel ware such as wash bowls, drinking fountains, etc. Removes water lines, rust stains, etc. Will not scratch or mar the surface.

Elusholeum

Liquid or Powder

Products for the removal of discolorations, stains, and deposits of scale from toilet bowls and traps. Flusholeum keeps your traps free from chemical deposits which sometimes cause a great inconvenience by clogging.

GENERAL FLOORCRAFT, INC.

333 Sixth Ave., New York City

MORE POWER — MORE SPEED — LOWER COST

Are the three most important factors in the purchase of a floor machine for your school building.

The complete line of Noiseless General floor machines offers all these factors. You can purchase a model to suit any type of work or size of budget. We offer you either the heavy-duty gear-driven single-brush type or the speedy two-brush model. All our models have all of the weight concentrated directly over the brush area for maximum efficiency in performance of floor maintenance work.

All Noiseless General floor machines are powered by motors of exceptionally rugged design and have unusual quick starting torque. Perfect balance and simplicity of construction are features of this ultra-modern electric floor servant.

THE NOISELESS GENERAL SINGLE-BRUSH FLOOR MACHINE

Heavy-duty — All gear drive

Made in five distinct sizes: 13"—15" Jr.—15" Sr.—18"

THE NOISELESS TWIN-BRUSH FLOOR MACHINE

Made in three sizes: 14"—18"—22"

The General heavy-duty single-brush models are intended for all types of floor work. They are correctly engineered and designed. All gears are enclosed in a solid leak-proof casting.

The General twin-brush models have no gears, no chains and no grease. They are driven by a series of heavy-duty Multi V Belts and carry a permanent guarantee against noisy operation. These models have been designed for speed, and are especially adapted for school buildings and hospitals.

The many advantages of the General line of floor machines may be seen on your own floors. You can **try** a General before you buy one. Write for our FREE TRIAL OFFER.

All models of General floor machines will

WAX—POLISH—SCRUB—DRY CLEAN—REFINISH, ALL TYPES FLOORS

INTERNATIONAL CHEMICAL CO.

ESTABLISHED 1898

3130-3140 S. Canal Street, Chicago, Illinois

DURA SEAL — *The Proven Floor Treatment*

GYMNASIUM, UNIVERSITY OF ILLINOIS, URBANA, ILL.

Officially Endorsed by

The Maple Flooring Manufacturers' Ass'n.
Oak Flooring Manufacturers' Ass'n.
Southern Cypress Association
Masonite Corporation
The Brick Association
Arkansas Oak Flooring Co.
And Many Other Individual Flooring Mfrs.

Proof:—

Dura Seal has been in successful use for more than six years. More than 13,000,000 square feet of floor have been treated by the Dura Seal method and are now providing the distinct economy and satisfaction which this method alone provides.

Different:—

Dura Seal is alone in its class. Do not confuse it with the common type of products on the market known as "seals," for Dura Seal is an entirely different material and naturally gives entirely different results.

Permanent:—

Everlasting—that's one of the valuable different features of Dura Seal. There is no change nor disintegration. It goes into the wood and stays there.

Low Cost of Care:—

Dura Seal makes beautiful surfaces; it preserves the wood. However, its biggest value from a strictly practical angle is its low cost of upkeep; lower than any other material now available.

Tremendous Savings:—

Treating a floor with Dura Seal does not mean that it will never require any further care of any nature. Such a claim would be absurd for traffic brings dirt on a surface and that must be removed. However, because Dura Seal is in the wood; because it is a permanent material, resanding or refinishing are eliminated. And the cost of maintenance is lower than can be had in any other way. Furthermore, this simple care causes the floor to improve in appearance rather than deteriorate. In most instances, this saving in maintenance during the first year alone more than equals the cost of materials for the initial treatment of the floor; and the saving thereafter is four to five times as great.

YOUR CO-OPERATION

Will Enable Us to Serve You Best

Dura Seal is unusual in that it is satisfactory under many different conditions. Naturally, the procedure must be varied to meet the situation. On some floors, asphalt tile for instance, Dura Seal cannot be used. For that, we have a special material, Asphalt Finish. Our experience permits us to offer you a definite method for the care of any floor that will give you satisfaction and economy and your co-operation will enable us to serve you best. You will receive logical and practical results whether your floors are wood, cork, cement, terrazzo, rubber or asphalt tile; whether the floors are in the class rooms, corridors, gymnasiums, or laboratories; whether you wish to finish your floors, wax them, or scrub them: so please do this:

Tell us:
- the kind of floors you have—
- treatment or finish if any—
- location of the floor—
- method of maintenance now followed—
- approximate floor area—
- whether you have a floor polishing machine.

We will tell you what you can do and how you can do it; your material costs; the subsequent maintenance of the floor. Thousands are now receiving new economy and satisfaction by following our suggestions. You may confidently expect the same.

INVINCIBLE VACUUM CLEANER MFG. CO.

Dover, Ohio, U. S. A.

Invincible Portable Vacuum Cleaners are especially practical for school cleaning. The many schools, colleges, and universities that are now using them find that they are indispensable in maintaining an economical as well as practical program of thorough cleaning

THE INVINCIBLE UNIVERSAL PORTABLE

THE INVINCIBLE ALL-SERVICE

"Invincibles," with their powerful suction and correctly designed cleaning tools, quickly remove every trace of dust and dirt to one easily emptied container—no dust can escape the exclusive Relaxed Filtering.

Engineers approve their sturdy and compact construction, especially as they remain outstanding in portability which allows them to be moved quickly and easily wherever needed.

"Invincibles" clean thoroughly any type of floor or surface, including blackboards, chalk troughs, and erasers.

The Invincible Universal Portable

More cleaning power is developed by this machine than any other of equal horsepower. It is sturdily constructed to give years of dependable service, yet it is so portable that it follows the operator by a slight pull on the hose, and can be easily taken up and down stairs. It is equipped with a generous size metal dust container in which all dirt is separated from the air and securely held in one easily accessible, metal dust receptacle. There are no exposed or inflated bags, no screens to clean, no buckets to empty. No dust or dirt of any kind ever touches the fans or mechanical parts of this machine.

Motor—¾ hp.	Height—37 in. over-all
Suction—42 in. water	Width—23 in.
Volume—135 cu. ft. per min.	Weight—70 lbs.

The Invincible All-Service

This model is lighter in weight than the "Universal," yet embodies all the superior Invincible features. It is a remarkably efficient cleaner at a surprisingly low cost. The tremendous pick-up power of this model, in spite of its comparatively light weight, compels complete removal of all dangerous, destructive dust as well as surface litter.

Motor—½ hp.	Height—19 in.
Suction—30 in. water	Width—12 in.
Volume—120 cu. ft. per min.	Weight—42 lbs.

Other Models

There are ten models in all, graduated in size, weight, capacity and price. . . . A machine to properly meet any cleaning requirement. . . . Tools, in a wide assortment, to correctly attack any cleaning problem.

May we send you complete information and recommendation for your buildings? There is no obligation, so write today

THE AMERICAN SCHOOL AND UNIVERSITY

Established 1898

LINCOLN-SCHLUETER FLOOR-MACHINERY COMPANY, INC.

Phone: Superior { 8944 / 8945

MANUFACTURERS

Floor Surfacing - Waxing - Polishing - Scrubbing Machines

213–221 W. Grand Avenue, Chicago, Ill.

Whether the floor space to be scrubbed, sanded or polished is measured in square feet or acres, there is a Lincoln Machine of the most advanced design and correct size for economical maintenance.

Since these machines are already standard equipment in many of the largest schools and institutions throughout the country, they need but little introduction.

Forty years of successful floor machine manufacturing is built into every Lincoln. Every product in the Lincoln-Schlueter line is correctly designed and ruggedly built.

THE NEW 3-IN-ONE MULTI-PURPOSE MACHINE

In small classrooms, or large gymnasiums, assembly halls, school cafeterias—regardless of the size of the floor space—the new 3-in-One Lincoln-Schlueter Multi-Purpose is the perfect machine for sanding, cleaning, steel-wooling or polishing.

As its name implies, the Multi-Purpose Machine is adaptable to a variety of uses—all necessary to the proper preparation and care of wood floors.

SPECIFICATIONS

Motor—1 H.P. ball bearing — constant speed.
Drum — 9" wide—speed 1000 R.P.M.
Dust Collector — Ball bearing — highly efficient.
Drive — "V" belt—positive smooth and silent.
Weight—125 lbs.
Equipment — 50 ft. extension cable—dust bag—sand paper—steel wool—polishing brush, wrenches, etc.

The small illustration below shows a Multi-Purpose steel wooling off the black dirty accumulation found on a classroom floor that has been excessively oiled

LINCOLN TWIN-DISC TYPE NO. 16

This model is recommended for smaller schools for cleaning, scrubbing or polishing. It has two 8-inch diameter brushes covering a floor span of sixteen inches, yet the machine is so compact that it may be used in congested areas or in primary grade rooms with complete satisfaction.

Handle may be set to allow the machine to pass under low furniture, desks, etc.

Average capacity of the Type No. 16 is from 1500 to 2000 square feet per hour.

LINCOLN TWIN-DISC TYPE NO. 20

This type is recommended for the larger grade school or high school, and especially for scrubbing and polishing floors in assembly halls, corridors, gymnasiums, etc.

This model has two 10½ inch diameter brushes which cover a total floor span of 21 inches overall. The machine is powered by a ½ H.P. heavy-duty ball-bearing motor. A 5-gallon water tank with lever control for water feed, as illustrated, is optional equipment.

Average capacity of the Type No. 20 is from 2500 to 3500 square feet per hour.

There are 12 models of Lincoln Floor Machines — one of which will fit your requirements exactly

WRITE TODAY FOR COMPLETE DESCRIPTIVE CATALOG AND DETAILS OF FREE TRIAL OFFER

THE AMERICAN SCHOOL AND UNIVERSITY

THE SPENCER TURBINE CO.

Hartford, Connecticut

THE SPENCER CENTRAL VACUUM CLEANING SYSTEM

The Spencer Central Vacuum Cleaning System has met with the approval of architects and engineers everywhere, and has been installed in more than 10,000 buildings, including more than 1500 school buildings.

Cleaner Schools—For school buildings, the Spencer Central System has introduced a new standard of cleanliness. Numerous tests have demonstrated that the Spencer System removes 25 to 50 per cent more dirt in pounds under similar conditions than other methods.

No Dust—The Spencer Central System removes dangerous dust. Even the finest dust is drawn in by large volumes of air under heavy vacuum and goes down to a container in the basement.

Speed—The Spencer Central System saves time. The Spencer System usually shows a saving of 20 to 30 per cent of the operator's time on bare floors. In cleaning other parts of the school building, however, such as rugs, walls, chalk trays, etc., there can be no comparison. If the janitor were to attempt to clean these parts as well as the Spencer Central System does, it would require two to ten times as much work!

For Cleaning Erasers and Chalk Trays—The Spencer Central System, instead of scattering the great bulk of the chalk dust on the floor, provides a method of cleaning erasers and chalk trays that is rapid, sanitary, easy and thorough. The janitor has only to attach a special tool and move it across the surface of eraser or chalk tray.

Cleans the Boiler Room—This system cleans boiler room floors—removes dust and soot from pipes and draws soot out of the boiler tubes, often saving the whole cost of operation in this one item alone.

Swimming Pool Cleaning Equipment—By means of special cleaning tools usually employed in connection with the pump on the filtering system it is possible to remove accumulated sediment from swimming pools without the waste of water involved in draining the pool. Bulletin on request.

Booklet—A number of Spencer-cleaned schools are illustrated in our booklet, sent on request.

Heavy Duty Portables—A new light weight portable vacuum cleaner using the same type of vacuum producer and the same tools is available at low cost for small public and private schools. Demonstrations available on request. Write for the pamphlet.

CENTRAL SYSTEM

PORTABLE SYSTEM

G. H. TENNANT COMPANY

Established 1870

GENERAL OFFICE AND FACTORY
Minneapolis, Minn.

Eastern Sales Office, Westfield, N. J.

THE TENNANT FLOOR MAINTENANCE SYSTEM

You have probably tried several different ways of caring for the wood floors in your buildings. Whether or not you are today satisfied with your floor treatment, a demonstration of the Tennant System will interest you. It is used successfully in almost every city for the toughest floor maintenance jobs. It is the only method of caring for wood floors receiving heavy traffic that embodies **all** of the following features:

1. Well preserved floors at annual expense less than scrubbing
2. Thorough cleaning of the dirtiest floors without soap, water, or sanding
3. Non-slippery floors
4. Floors more beautiful and easier to maintain as they age
5. A maintenance system which prolongs the life of wood floors
6. Refinishing possible while room is occupied
7. A surface which does not scratch, mar or wear through
8. A complete maintenance program which can be carried on successfully year after year by the janitor or regular maintenance man

The Tennant System follows a simple procedure. It can be used successfully for treating a new floor or for reconditioning any floors that have formerly been oiled, scrubbed or given some other care.

Scrubbing, Wax Polishing: The Tennant Machine can be used for all types of floor work. It can be used with suitable brushes for efficient scrubbing and wax polishing.

Costs: The Tennant Company will gladly furnish cost figures obtained from nationally known institutions using the Tennant System.

Further information, with illustrated circular, will be sent on request. One of our trained floor experts will gladly demonstrate the Tennant System for you.

Representative Users of the Tennant FLOOR MAINTENANCE SYSTEM:

United States Government — 250 machines
Sears, Roebuck & Co. — 50 machines
Continental Baking Corporation — 68 machines
Board of Education, Minneapolis — 12 machines
Also Boards of Education at Pasadena, District of Columbia, Milwaukee, Baltimore, Fort Wayne, Sioux City and many other cities; Teachers Colleges at Superior, La-Crosse and Milwaukee, Wis.; U. S. Naval Academy at Annapolis; University of Minnesota

Recommended by the
Maple Flooring Manufacturers Association

DEMONSTRATION OF TENNANT SYSTEM OF FLOOR MAINTENANCE AT CONVENTION OF NATIONAL ASSOCIATION OF PUBLIC SCHOOL BUSINESS OFFICIALS, MINNEAPOLIS, OCTOBER 14-19, 1935

Section IV

LANDSCAPE DESIGN AND DEVELOPMENT

Landscape Development of the School Site

A Score Card and Standards

BY HAROLD S. BATES

PRINCIPAL NORWOOD HIGH SCHOOL, NORWOOD, OHIO

AND

A. CARL STELLING

BRIGGS & STELLING

LANDSCAPE ARCHITECTS, NEW YORK CITY,

AND CHARLESTON, S. C.

NOT all the influences involved in the education of youth in this modern era are to be found in the creation of a fine building or in the offerings of the classroom. Not only must the child's intellectual attainments be made secure, his physical well-being and development established, and his moral understanding and stamina promoted; but activities and situations must be provided that furnish a background of culture.

No single type of educational endeavor will insure this enlightenment and progress. Cultural growth and esthetic appreciation, stimulated by contact with the teacher, may be quickened by beautiful school grounds—an influence difficult to measure, but freely admitted. A pleasing school site, surrounding the workshop of the student throughout most of his formative years, not only has an immediate reaction upon his attitudes and habits, but creates impressions that carry over into his adult life.

Moreover, attractive, well-landscaped school grounds are of distinct advantage to a community, reflecting credit upon it, and influencing outsiders to make the city their home. A well-planned and developed school site creates civic pride and often results in a general toning-up of the community through individual activities. One has only to look at "before and after" pictures of school grounds to be awakened to an appreciation of the influence of such landscape development.

The following score cards and standards were evolved at the suggestion of Dr. N. L. Engelhardt, of Columbia University. A survey of them will acquaint one with the magnitude of this part of a school-building program and emphasize their importance in the educational process.

SCORE CARD FOR LANDSCAPING SCHOOL SITES

Location of site under consideration.....

ITEM	DESCRIPTION
I. SELECTING THE SITE	
A. Consultation with landscape architect before selection is made	Present-day problems of transportation, building designs, surveys of city structure, the growth of cities, the necessity of artistic arrangements, quality of soil, topography and many other considerations, make it advisable to secure the expert services of the landscape architect before the site is selected.
B. Cooperative planning of various areas and location of building decided upon by landscape architect, architect and educational consultant	The attempt to work without various experts covering all phases of the school-building program is to guess at results; this is usually an expensive and disappointing process.
C. Location of the site: 1. Environment 2. Hazards	It is undesirable to locate a school building amid unfavorable surroundings. Business districts and others that are devoted to commerce are not desirable. Sites near railways or street-car lines should be avoided. Residential areas, away from busy thoroughfares, where there is complete freedom from noises, dirt and dust, malodors and hazards of all kinds, are best.

ITEM	DESCRIPTION
D. Topographical survey	A topographical map is essential to the landscape architect in designing the layout of the ground and frequently results in the development of many improvements and modifications. It will show the location of existing trees which may play an important part in the landscaping scheme.
E. Boundary line survey	Such a survey is of great importance to the landscape architect in determining site limits.
F. Sufficient space provided for: 1. Building 2. Play areas 3. Parking 4. School gardens 5. Educational activities 6. Plantings 7. Future extensions of plant	The school site today must be large enough to provide for all the activities of the educational program. We no longer think of the educational process as being confined to the four walls of a classroom. The "whole child" must be considered in our modern conception of the education of the individual. In some states school sites are determined by statute. In many instances these are minimum requirements, however, and should not be allowed to become the maximum in desirability. Future growths of the school should receive consideration in site selection, since schools cannot be built every year.
G. Size of site	The standards (minimum) are 5 acres for the elementary school, 10 acres for the junior high and 20 acres for the senior high school. Modern trends in education would dictate the enlargement of these so-called standards.
H. Consideration of hazards	Heavy-traffic streets are bad for school boundaries. Where encountered, their dangers should be circumvented by the use of overpasses or underpasses. The most widely used entrances should be on side streets.
I. Budget provisions for landscaping	It is imperative that school-building budgets should be drawn sufficiently large to care for landscaping work. The monies assigned are usually insufficient because so-called extras in the building proper absorb funds originally intended for landscaping. A desirable practice is to separate the landscaping budget from the general building budget and to keep the funds of the former intact.
J. Cost of site and its improvement	The cost of the site and its improvement can best be estimated by comparing it with the cost of the building itself. Ten per cent of the cost of the building is an ideal standard for landscaping.
II. PLANNING THE LOCATIONS	
A. General 1. Cooperation of architect, landscape architect, structural engineer and educational consultant in planning various areas	Cooperation is highly advisable in planning the locations of the various areas. Only in such a manner can coordination and economy come.
2. Preliminary sketch of the entire layout	A preliminary sketch of plans should be made by the landscape architect and presented to the board for its approval. The final sketch should produce the desired development from the artistic and practical standpoint.
3. Consideration to location of building	The building should be placed so as to give a pleasing appearance from the street. Play areas should have direct connection with the gymnasium.
4. Location of drives and walks	Proper planning will result in walks and drives so located as to directly serve their purpose. No drives should cut the space between play areas and building. Conditions encountered in bad weather should determine the location of drives.
5. Planning service drives	The service drives should be separate from the general drive and should be located to serve the service portions of the building.
6. Location of play areas: a. Relationship to other units b. Consideration of expansion c. Size	The planning for the gymnasium will largely determine the location of play areas. They should be set away from the building far enough so that they do not interfere with future building developments. In the elementary school one-third of the site should be reserved for play area; in the high schools 50 per cent of the site should be set aside for play.

ITEM	DESCRIPTION
7. Location of school gardens	In planning school gardens the location should be considered in relation to other areas. If the site permits, a section set aside for nature study is an educational advantage. Gardens should be so planned as to be removed from the hazards of play areas. They should not be scattered about various parts of the site.
8. Planning drives and walks	Grassed space between drives and walks should be planned. A drive should never serve the dual purpose of walk and drive.
9. Grass areas near building exits	Sufficiently large areas should be planned at the building exits to accommodate students as they come from the building, thus protecting them from the hazards of the street.
10. Outdoor classrooms and amphitheater	Modern educational theory emphasizes the desirability for more out-of-door work. Classrooms should be planned so as to permit the use of adjacent areas for out-of-door classroom purposes. Areas should be set aside for amphitheaters.
11. Consideration	The welfare of the child should be the motive behind school-ground planning. Their safety and comfort should be the governing forces.
B. Elementary level 1. Kindergarten area (separate)	A special area should be set aside for the educational and recreational activities of the kindergarten group. This area should be adjacent to and accessible from the kindergarten room. It should be separated from other parts of the ground by fences properly landscaped.
2. Location of apparatus areas	Safety should dictate the need for such a separation. The ground for apparatus needs special construction which is not adaptable for mass play areas.
3. Provision for shade on play areas	Shade is a desirable factor in planning play areas, especially those designed for smaller children or for schools located in hot climates. Every school should provide for some shade in its play areas.
4. Inclusion of baseball diamond Inclusion of basketball courts	Since practice and custom have established these games as desirable recreation for the elementary grades, space should be set aside devoted to the development of these sports. They are educationally desirable.
C. The Junior High School 1. Parking space provisions	Parking space should be provided apart from the main entrance drive to the building. Two hundred and seventy-five cars can be parked on an acre of ground if the system of directive parking is used. Approximately 190 cars can be parked on an acre of ground if the parking is not directed.
2. Level areas for large play areas	Where sites are hilly, planning should be effected that will make possible the reservation of level grounds for large play areas, or reservations of areas necessitating the least filling and grading.
3. Provisions for: a. Handball b. Tennis c. Baseball d. Basketball	Handball courts should often be built where retaining walls can be utilized, unless other features make such use undesirable. Tennis courts are best located in corner areas not used for other purposes. Baseball diamonds and basketball courts of adequate size and construction, sufficient in number to care for school needs, should be planned for.
D. The Senior High School *Consider those items listed under Junior High School.*	*Consider those standards listed under Junior High School.*
4. Football field and running track	Space should be provided for a football field with quarter-mile running track surrounding the field. Ample space and accommodations should be provided for anticipated crowds at athletic events.
5. Additional parking space for others than students	In addition to parking space for high-school students in regular attendance, parking facilities should be ample to care for crowds attending athletic games and events of public interest held in the auditorium.

ITEM	DESCRIPTION
III. DRAINING AND GRADING	
A. Grading 1. Cooperation of experts in matters pertaining to grade levels, extensions, relationship of walks to building entrances, drives, etc.	In grading sites the cooperation of the architects is necessary in effecting economy and in satisfying educational requirements. The levels of the building elevations should be determined by the site. The moving of dirt can be minimized, the utilization of natural contours effected, and the planning of building entrances, as they affect the directness of walks, drives and service approaches, brought about through close cooperation.
2. Topography of land as it affects planting	Economy demands that contours of hilly sites be used to best advantage in planning the several areas of a school site.
3. Economy through planning	So far as possible, buildings should be designed to fit the site. The idea that buildings cannot be located on sloping terrain is a mistaken one. Ground floors below grade levels can be effectively planned. Small play areas and gardens can be placed on spaces thus requiring little grading. Large play areas can be economically placed through planning. Retaining walls, where necessary, can often be used for other purposes.
4. Gradient of: a. Drives b. Walks	The gradient on the roadway approaches to the building should be kept as low as possible; 6 to 8 per cent is about the maximum grade desired. Where the building is elevated at a considerable height above the approach drive, it is better to work out a terrace or two with steps than to increase the grade on the drive. The use of steps should always be minimized. The gradient of walks is of course limited by conditions: where possible, ramps should be used to eliminate steps. Both walks and drives should be as direct as conditions will permit.
5. Consideration of future extensions	In establishing grades and plotting areas it is quite necessary to take into consideration possible extensions of the plant. Later expenditures can thus be curtailed and the perpetuity of the plan insured.
6. Minimizing of terraces	The maintenance and care of terraced grounds is difficult and expensive; except where made necessary by gradient, their use should be restricted.
7. Protection of native trees and shrubs	It is highly desirable to save many native trees and shrubs found on the site and to blend them into the plan for beautification. After being selected, they should be amply protected during the grading and building processes by fences or by other suitable means. Oftimes it may be desirable to move them.
8. Consideration (when grading) to other phases of work	The bringing-in of conduits, sewage and public utility lines (lights, telephone, etc.) should be all underground. The planning should be so effected that installation is made before final grading takes place. It is desirable to combine drainage from leaders and from surface drainage into one storm sewer.
9. Elevation of building on site	The building should be elevated on the site, with ground sloping away from it on all sides. Where the building and the street are separated by a depression, it is essential that the building be elevated.
B. Drainage 1. Surface drainage	Surface drainage is an important factor on both level and hilly ground. On level ground the important factor is getting the water away so that it does not stand on the various areas.
2. Use of catch-basins and gutters on hilly sites	On hilly sites care must be taken to see that rapidly running water does not wash out the drives, lawn or play areas. Catch-basins and gutters should be provided to prevent this from occurring. On all sites the ground should slope away from the building on all sides.
3. Adequacy of underground drainage	Underground drainage is necessary where soil is of a type that does not drain readily. Adequate underground drainage will keep the underground water level uniform and will prevent soggy grounds. Underground drainage should be used on all athletic fields, play areas and elsewhere if soggy ground conditions dictate the necessity of such type drainage.

ITEM	DESCRIPTION
4. Water suppiy to all parts of site	Provisions should be made for water service to all parts of the site. Athletic fields and lawn areas are in frequent need of moisture. Where possible, underground lines should be laid and an adequate sprinkling system installed. These lines should be laid after all finished grades are determined.
IV. CONSTRUCTION	
A. General 1. Installation of underground drainage system	Lateral drains laid underground with continuous slope provided is the satisfactory type. Tile should be embedded by crushed rock.
2. Construction of drives and walks: a. Paths	Where economy dictates, concrete walks should be installed. The use of flagstones is highly desirable and effective on many sites. Drives may be of macadam or concrete. Local conditions will describe the type of paths and their construction.
3. Widths: a. Of walks b. Of drives c. Location in relationship to streets	Sidewalks should not be less than 8 feet in width; near the main entrances the width should be 10 to 15 feet. Drives should not be less than 18 feet in width (two-way drive) with 24- to 32-foot widths at loading and unloading zones. Turning areas should have a radius of 60 to 65 feet. The driveway for taking children to and from school must be adjusted to the approaching streets and pass the principal building entrances and exits.
4. Retaining walls: a. Materials b. Drainage	Retaining walls that are connected to or adjacent to the building should be constructed of material harmonious with the building, or should be covered with vines (when conspicuous). When constructed of different materials (field stone, etc.), they should be neutral in color. Usage, durability and economy should be elements of consideration. There should be drain pipes at the base of all retaining walls.
5. Style and design of lamp standards	Lamp standards and fixtures arranged about the grounds should be in keeping architecturally with the structure itself.
6. Provisions for fences	Fences of chain-link type should separate all play areas from other parts of the grounds and from the streets adjacent. Where used, they should be concealed with shrubbery, vines, etc.
7. Provisions for drinking water	Outside drinking fountains of bubbling type should be located adjacent to or on all play areas.
8. Rest houses, pergolas, etc.	Benches, pergolas and rest houses should be constructed of good architectural design and should be advantageously included in the general plans.
B. Elementary and Kindergarten 1. Kindergarten areas: a. Size and location b. Apparatus c. Construction of pools, sand-boxes (safety and health criteria) d. Grassed areas e. Fences	Kindergarten areas should be of ample size to care for various activities. Playground apparatus suitable to the child's age should be located in one corner of the plot. Ground should be of packed sand or gravel surface. Sand-boxes should be built to provide drainage and should be surrounded by cement platforms so that the child does not stand on the damp ground. All pools should be of shallow construction. Grassed areas should be planted with a type of grass resistant to wear. The entire area should be fenced off from the other areas of the site and landscaped with shrubs. Animal cages and aquariums should be planned as part of the equipment.
2. Apparatus area of elementary school: a. Location b. Construction	It is best to locate playground apparatus on a plot of ground apart from other play areas. The plot should be well graveled. The hard-surfacing of apparatus areas is not desirable.
3. Play areas grassed	Large elementary play areas should be grassed with type resistant to wear.
4. Planning of basketball courts	Elementary basketball courts should be 35 x 70 and should be constructed of well-compacted gravel. They should be oriented north and south.
5. Location and construction of baseball diamonds	Baseball diamonds should be of size suitable for soft ball and so located that the batter faces southwest. Grass diamonds with skinned areas around the base lines are recommended.

ITEM	DESCRIPTION
C. High Schools 1. Athletic field: a. Drainage b. Grading c. Orientation d. Planning	Athletic fields should be well drained and graded with a crown of 12 inches. They should be seeded with a type of grass resistant to wear. On hilly sites quite frequently hillsides can be utilized at small expense to afford bleacher arrangements. The gridiron should be centrally located on the field and oriented north and south.
2. Track: a. Planning b. Construction c. Drainage	A quarter-mile running track should surround the athletic field or football field and should have a 220 straightaway located on the side arranged for permanent seating. The straightaway should be 20 to 24 feet in width, with the ends and back stretch of the track not less than 16 feet in width. Inside and outside curbs of concrete should be constructed to hold the track. The track should be of screened cinders laid on a 3-inch cushion of clay and sand loam mixture with a subbase of crushed rock or heavy gravel. Underground drainage should be provided for the track.
3. Tennis courts: a. Size b. Number c. Construction d. Location	Tennis courts of regulation size should be planned in sufficiently large numbers to meet the demands. Clay and gravel courts are very satisfactory; for all-weather purposes cement and hard-surface courts should be provided. Each court should have backstops of sufficient height. All courts should be located north and south.
4. Basketball courts: a. Construction b. Size c. Location	Basketball courts should be constructed of hard-packed gravel. They should be planned, when possible, in corners of the site not reserved for other functions. They should be of regulation (60 x 90) size and located north and south.
5. Baseball diamonds: a. Type b. Construction c. Location	Baseball diamonds for both hard and soft ball should be planned. Grass areas with skinned base lines are recommended. The fields should be so laid out that the batter faces southwest.
6. Parking areas: a. Construction b. Location	The parking area should be constructed of concrete or other hard-surfacing material. It should be of ample size and located as near to the building entrance as possible. It should be properly screened with shrubbery.
V. PLANTING	
A. Turf 1. Quality of top soil	The top soil should be of a quality approved by the landscape architect.
2. Time of seeding	The seeding should be done in the late seasons when weed growth is not so apt to accompany grass growth. When necessity demands a quick growth for fall use, as in the case of an athletic field, Italian rye grass may be planted in the early seasons. Climatic conditions will to a large extent dictate planting practices.
3. Type of seed used Method of planting	The type of grass used should depend on the region in which it is to be used and should be selected on this basis. After seeding, the areas should be raked-in and rolled. Excessive watering of newly seeded areas should be avoided.
B. Shrubs and trees 1. Effectiveness of outdoor classrooms and amphitheater	Outdoor classrooms should be planted with hedges to insure privacy. The plantings should be so grouped as to fit into the building picture. The location of the amphitheater should be such that it lends itself to vegetation and contours.
2. Location of plantings	All planting should be so made that the activities of the school are not impaired in any way.
3. Preservation of natural beauty of site	It is highly desirable to preserve so far as possible the natural beauty of the site.
4. School gardens: a. Provisions for b. Type plants used c. Labels	School gardens should be included in the general grounds plan. A variety of plants should be used so that flowers will be in bloom throughout the flowering season. Specimens should be well labeled so that students may come to know types of flowers.

ITEM	DESCRIPTION
5. Factors in plant selection	Usage, adaptability, appearance and future growth should be the factors of major consideration in plant selection. Soft maples and trees of similar character should not be used, because of their short life. Evergreens should be used with some care as to their place of planting inasmuch as the ground around them is usually damp; also, certain types are dirty.
6. Types that should be excluded or used reservedly	Thorny trees and those bearing fruit, nuts or berries should be used reservedly. Many trees of this type are dirty; children are more apt to be climbing in them, and the branches are apt to be broken. Then, too, the element of child welfare is to be considered. Thorny shrubs can often be used where a barrier is needed, however.
7. Unsightly places screened	Unsightly places about the school ground should always be screened with shrub plantings and trees.
8. Modesty of planting scheme	All plantings should be so planned as to frame the building and bring out its architectural beauty in such a way that when viewed in entirety the scene is a pleasant one. The landscaping should always be controlled in such a way that the "frame of the picture" does not detract from the picture itself—the building.
9. Treatment of blank walls	Blank walls should be broken by tall plants, trees or vines.
10. Size of specimens used	It is well, when possible, to select specimens that have a good growth. The immediate effect is more pleasing and the older specimens stand up better under the transplanting.
11. Protection of young plantings	It is absolutely essential that young trees and shrubs be protected from trespass and from storm dangers. Braces of various kinds can be constructed to protect the young specimens from wind storms, etc. Temporary fences can be cheaply constructed to prevent trespass.
12. Use of flowers and flowering shrubs elsewhere than in the school garden	While it is probably most desirable to restrict the use of flowering plants to the school gardens, there are instances where flowering shrubs and some perennials can well be used in placees about the plot and in border plantings.
13. Use of ivy on building	Ivy can be used to considerable advantage on many buildings to break the severity of the structural lines.
14. Educational value of labeling specimens	Labels should be used on specimens in order that the child may come to know various types of plantings. Since the school is an educational institution, this type of instruction should not be overlooked.
VI. MAINTENANCE	
1. Consideration of cost of maintenance	Simplicity should be the keynote of school-ground landscaping. If the set-up is a simple one, the maintenance costs may be held to a minimum.
2. Gardener to care for grounds	Permanent beauty of the site, and the investment that is represented in the landscaping program, demand that they be properly cared for. This can be best assured if a competent gardener is employed as a member of the maintenance staff. When his specialized duties do not take all his time, he can be utilized for janitorial service. A janitor should not be hired and given care of the grounds as an extra duty, however, since most janitors know little of plant care.
3. Consideration of fertilization needs	Proper attention should be given to the necessity for occasional fertilization of plant growths and seeded areas. These needs should be anticipated and the maintenance budget set up to provide for them.
4. Protection of plantings, grass areas, etc.	The adage that "anything worth having is worth taking care of" holds for the landscaping program. Timely precautions should be set up to prevent trespass and undue wear on areas not designed for play. Young trees and growing shrubs should be fenced off or otherwise protected. Much of this is an administrative problem, but it is one that should not be overlooked.
5. Care of trees	Grass should be allowed to grow up to the trunks of grown trees. When trees are young and watering and fertilization are necessary, grass growths are cut away and the area about the base of the plant cultivated. After sufficient growth this is not necessary.

See page 181 for Annotated Bibliography.

Making Parks of the Fort Worth School Grounds

BY R. C. MORRISON

DIRECTOR OF SCHOOL LANDSCAPING PROJECTS; CITY FORESTER FOR FORT WORTH, TEXAS.

TOO long, people have thought of school grounds as places on which only children might play. The thought of developing such areas into parks has been somewhat foreign to most communities, yet to use school grounds only during school hours means wasting over fifty per cent of their usable time. It is this mistaken attitude toward school-ground development that the School Board and the Park Department of Fort Worth have undertaken to correct.

The comprehensive plan for the development of the Fort Worth park system calls for neighborhood playgrounds in every congested area within the city limits, but unfortunately the problem of securing parks within these areas is far too expensive and extravagant to solve in the normal way. With the need of such play areas and neighborhood parks, the Park Department agreed, in the fall of 1933, to assume the responsibility for the development of the Fort Worth school grounds for these purposes.

DIAMOND HILL PLAYFIELD, FORT WORTH, AFTER IMPROVEMENT

An Effective Program

It happened that the Board of Education had just undertaken a four-million-dollar building program and a general rehabilitation of the entire school plant. Following the Strayer and Engelhardt report which had been made two years previously, the School Board began its policy of enlarging all school grounds that were classed as "too small." With such a program under way, it now appears that Fort Worth will have an adequate park system composed of properly located neighborhood parks, as well as an outstanding school plant, with a maximum saving to the taxpayers. The result will be that Fort Worth will be prepared with recreational and educational facilities for the time of more abundant leisure.

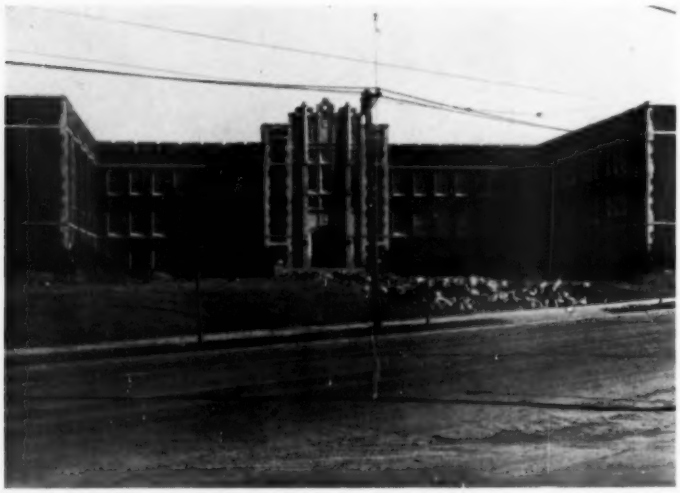
The firm of Hare & Hare, landscape architects, was employed in the fall of 1933 to serve not only as consultants for the Park Board, as it had been for ten years previously, but also as consultants for the school-ground development program. This firm, with the assistance of some sixty engineers from the local CWA office, and the organization of the Park Department and the School Boards, began the surveying and designing of the 63 school grounds of Fort Worth.

By the time CWA was ready to begin its program, nine school grounds had been planned, at an estimated cost of $488,000. This sum was granted the Park Department and the School Board, and actual work started in November, 1933. By the fall of 1934 eight school grounds had been completed, and the ninth was completed early in the summer of 1935. According to Dr. N. L. Engelhardt, of Columbia University, who is serving as building consultant in the very extensive building program, this school-ground landscaping project is one of the most outstanding in the entire country.

Not only has this work resulted in the improvement of the morale of the teachers and pupils, but it has also changed the attitude of the entire community. Imagine the transformation in the short span of one year, from the most drab and desolate spots in the landscape to the most beautiful and inviting.

FENCE AND BORDER PLANTING AT SAGAMORE HILL ELEMENTARY SCHOOL, FORT WORTH

The two Boards believe that it is possible to raise the standard of citizenship by the creation of beautiful and inspiring environment. The school officials have been aided in their efforts to keep the children out of doors as much as practicable, learning from nature wherever possible, while the Park Board's problem of providing neighborhood parks for adults as well as for children has been most efficiently cared for.



WILLIAM JAMES JUNIOR HIGH SCHOOL, FORT WORTH, DURING DEVELOPMENT OF GROUNDS

With amphitheaters on many of the school grounds, these areas should soon become the centers of all activities within the community. Already on several of the improved grounds, there are weekly meetings of the people within the community. This affords a splendid opportunity for social guidance heretofore not possible.

At the present time these two political subdivisions, the Board of Education and the Fort Worth Park Department, are not resting on their laurels won during the past year-and-a-half, but are, through the Works Progress Administration, developing all the school grounds within the city at a cost of 2½ million dollars.

THE IMPROVED GROUNDS OF THE WILLIAM JAMES JUNIOR HIGH SCHOOL

With this undertaking completed, it is felt, an ideal will have been reached.

Divisions and Details of the Development of the Grounds

In the development of the school grounds, the first consideration has been the main divisions of the area: (1) the approach to buildings and grounds, which may be classed as the ornamental part of the development; (2) the play area, which is usually divided according to the use made of it; for example, the older children will require modern athletic fields, while the smaller children will require what we call kindergarten areas. In the past, on undeveloped school grounds, there were no areas designated for specific uses, and as a result we had poor playground space and very little ornamentation, which left them merely ugly spots. There was no order, without which there could be no beauty and very little usefulness. It was therefore extremely important that we should decide first upon these main divisions.

The next consideration in the development of the school grounds came under the classification of "details":

1. *Grading.*—It is the popular belief that "landscaping" means the planting of a few trees and shrubs as a means of ornamentation, but in reality the planting constitutes only a small part of the problem of making our grounds useful and beautiful.

After the main divisions were decided upon, with the understanding that as much area as possible should be given to play, the next step was the grading of the grounds. This was considered from the practical viewpoint as to use and drainage, and from the viewpoint of beauty in the matter of constructing pleasing slopes. In no case have the grades on used areas exceeded 2½ per cent, and wherever possible the

AT LEFT—BEFORE THE CONSTRUCTION OF THE WILLIAM JAMES PLAYFIELD, FORT WORTH

AT RIGHT—THE CLAY AND SAND PLAYFIELD AT THE WILLIAM JAMES JUNIOR HIGH SCHOOL

AT LEFT—EAST VAN ZANDT ELEMENTARY SCHOOL, FORT WORTH, BEFORE IMPROVEMENT OF GROUNDS

AT RIGHT—THE EAST VAN ZANDT ELEMENTARY SCHOOL AFTER THE LAWN AND SHRUBBERY BEDS WERE DEVELOPED

grades are such that the water flows away from the building to the street. Where this has been impossible, gutters have been constructed with catch-basins which carry the water underground to the street or to a storm sewer. All downspouts from the buildings have been connected with tile which carry the water away from the building, thus obviating much trouble from standing water and from the washing of soil, which has been prevalent where the downspouts have been allowed to open at the surface of the ground near the base of the building.

2. *Walks.*—The walks have been made direct, so that it is not necessary to go across lawn areas when entering the buildings or the playgrounds, and they are sufficiently wide, so that the children are not forced to create paths paralleling them. It has been found that few walks should be less than eight feet wide, and many of them should be from ten to twelve feet in width. In most cases the material used is cement with a float finish rather than a slick finish, so that there will be no slipping when the walk is wet. A still more pleasing effect in the use of cement is contemplated in the WPA program. It will be secured by an application of pea gravel to the top course of the walk, with the cement washed out just after it has obtained its initial "set." This will give an attractive pebbly effect which is quite comfortable for walking. Other material for walks has been used also, such as flagstone and asphalt. In the development of grounds where a naturalistic treatment has been employed, the use of asphalt has been highly recommended.

3. *Location of Shrubbery Beds and Plants.*—As a rule, the shrubbery beds have been placed at the foundations of the buildings, at the intersection of walks and around the borders of the play areas. The types of plants to be used have been studied very carefully and only those which are most hardy and least susceptible to diseases and insect attack have been employed. All questionable plants have been omitted so that the cost of maintenance of the grounds would be as small as possible.

4. *Lawns.*—Usually the ground in front of the school building or buildings has been devoted to ornamentation, which of course, involves as large a lawn as practical. Grass is also grown around the shrubbery beds, to keep the shrubbery away from the walk, and prevent the dirt from washing onto the walk. In the construction of the lawns good, rich soil has been used, so that little care will be needed to keep them green during later years of maintenance.

5. *Water System.*—It is absolutely essential that an adequate water system be installed, to keep all plantings and lawn areas alive during the summer months. In general, we have found that a 2-inch pipe should be used for the main line, with 1-inch lines for laterals. Water connections should be placed in boxes under the ground no farther apart than 150 feet. This will enable one to water the entire area with a 75-foot hose. In some cases it has been advisable to install a sprinkler system, and where this is done very careful study has been given to the problem. Wherever there are border plantings adjacent to a fence, the top railing of the fence has been used as a water line with spray jets at every 15 feet.

6. *Fence.*—We have found that the key to the solution of the problem of school-ground landscaping lies almost entirely with the construction of a fence around the play areas. This fence is of a chain link type and sufficiently heavy to withstand the hard usage it will doubtless receive. It is 5 feet high and conforms to the specifications prepared by standard fence manufacturers. In most cases it is placed 15 to 20 feet back of the walk, which allows a 10- or 12-foot planting in front of the fence as a means of ornamentation. By doing this, the usual ugly, barren and dangerous playground is replaced by one both useful and beautiful. The fence not only protects the shrubs from the children, but also prevents the children from running into the street, thereby obviating many accidents. One can readily see that without a fence around school grounds, all efforts for the development of such areas would be wasted.

7. *Surfacing Play Areas.*—Where the play areas do not receive too great a concentration of use, grass has been used satisfactorily, thus reducing the original cost considerably. In most cases, however, we have found it necessary to have some form of surfacing such as clay or asphalt. Where clay is used, three inches of gravel with two inches of clay and a light covering of sharp sand bladed to a smooth surface, wet and rolled, has been found extremely satisfactory. Considering the maintenance problem over a long period of years, we feel it advisable, on smaller areas, to use a more permanent type of surfacing, such as emulsified asphalt. This we are doing in the WPA program.

8. *Drinking Fountains.*—Drinking fountains on the school grounds have been located near the play areas, yet close to one side, so that they will not interfere with the use of the playgrounds. They have been so designed that they will be not merely useful but ornamental as well.

9. *Athletic Fields.*—In the Junior and Senior High Schools modern athletic fields have been developed which have included jumping pits, cinder tracks, volley-ball, hand-ball and tennis courts, baseball diamonds, and at least one gridiron.

10. *Lighting.*—It is our plan that every school ground shall have at least a few floodlights placed on the areas which are suitable for use during the evening, so that the grounds may be enjoyed to a greater extent than they have been in the past.

11. *Amphitheaters.*—With the construction of amphitheaters, the schools may hold outdoor as-

semblies and the community may conduct its meetings, its plays, and musical concerts. In every case where outdoor theaters have been built and where they are planned for future development, permanent seats are constructed which will seat crowds ranging from 1,000 to 5,000. Stages and, in some cases, suitable dressing rooms are also planned.

Coordination of Landscape Architects and Architects

One of the outstanding features of the landscape program is the correlation of the design of the grounds with the design of the buildings. In every case the landscape architect has worked closely with the architect and the various principals of the schools. In this way a well coordinated plan has been secured. For example, in the matter of the construction of kindergartens, such areas are designed adjacent to kindergarten areas of the building, so that the children may step from their indoor rooms into their outdoor rooms.

Usefulness of This Development

By proper development of school grounds our communities will be benefited, not only as far as the educational plant is concerned, but also through the use of the grounds as neighborhood parks. Through the cooperation of the Park and School Boards, there will be no overlapping of efforts, and beneficial, economical and wise administration will result for the general public.

We feel that our schools should be more than mere buildings where students go to learn from books. They should combine beautiful buildings and a setting of well-developed grounds to serve as an inspiration to the many thousands of children who do not receive such inspiration elsewhere. We should surround our children with beauty, so that a love for the finer things of life may be created and nurtured in their lives.

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(*See "Landscape Development of the School Site," by Harold S. Bates and A. Carl Stelling, pp. 170-176, this volume.*)

The University of Wisconsin Arboretum and Wild Life Refuge

BY FRANZ A. AUST

Landscape Consultant, University of Wisconsin,

and

G. WILLIAM LONGENECKER

Executive Director, University of Wisconsin Arboretum and Wild Life Refuge

ARBORETA are attracting the attention of many different communities in America. They appeal to the highest idealism of our social structure, for an arboretum affords opportunity for scientific research on the part of students and administrators in a field which carries man back to the very roots of civilization. Our nation has been very backward, considering its population and wealth, in the establishment of arboreta. Today we are embarking upon a new policy of reforestation and landscape development for recreation. We have discovered that trees are necessary not only for timber, for the protection of watersheds, to prevent erosion, and for technical purposes, but also for their inspirational value to mankind as a whole.

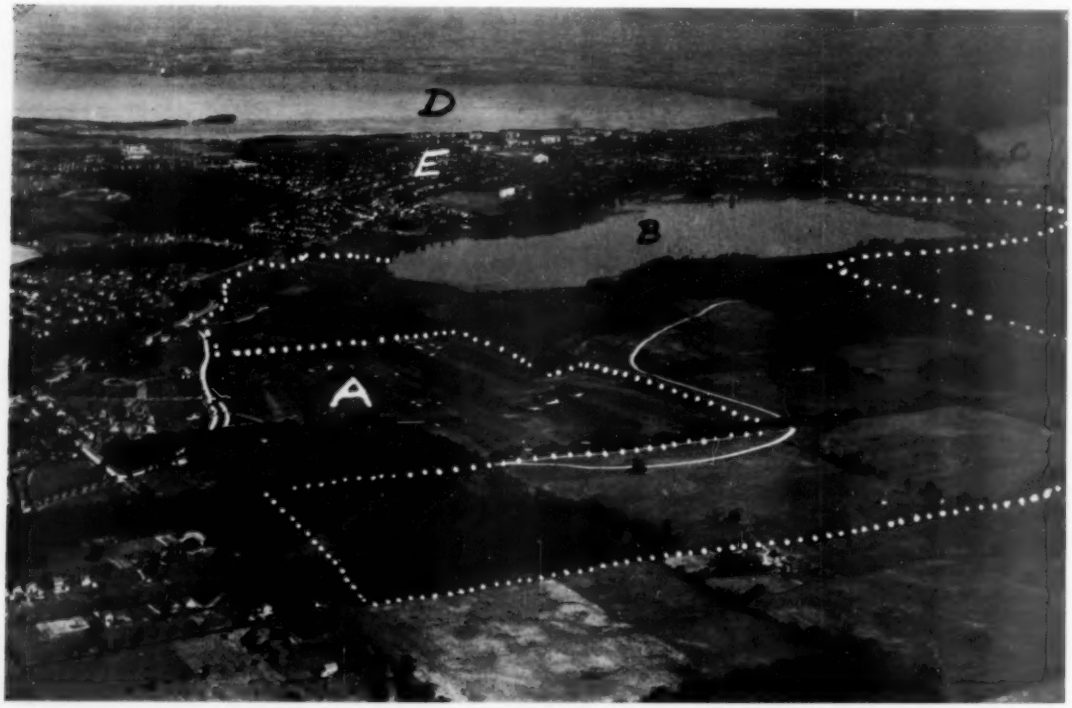
Arboreta have been set up for various purposes. The tree museum idea has been predominant. Major emphasis has usually been placed upon the arrangement "for convenient study of every species, variety, and hybrid of the woody plants of the world" able to withstand the climatic conditions of the locality. An arboretum may well be a laboratory for the study of trees and other plants with reference to their characters, their relationship, their economic value, their geographical distribution, and their improvement by selection and hybridization, but there are also other purposes which the arboretum may serve.

The University of Wisconsin Arboretum and Wild Life Refuge has been established for the following purposes.

The Purposes

The Wisconsin Arboretum is created to restore, at a point near the University, types of primitive Wisconsin landscape and its flora and fauna.

It will be for the study of plants and animals, as individuals and as groups; their ecological



AERIAL VIEW OF THE ARBORETUM AREA, LOOKING NORTHEAST TOWARD LAKE MENDOTA, FOUR MILES AWAY
A.—Country Club; B.—Lake Wingra; C.—Lake Monona; D.—Lake Mendota; E.—University Campus

relationships as well as their systematic classification, their cultural requirements, and, incidentally, their landscape and economic possibilities.

The only recreational uses to be served by the Arboretum are those which will enable folks to come into intimate contact with the out-of-doors. The use of the area as a picnic ground will defeat the primary purpose of the Arboretum.

Principles of Development

The following points are significant in the development of the plan for the Wisconsin Arboretum. In the division of the present-owned lands, those woodlands, marshes, and prairie areas were first set aside which were essential for the primary objects for which the Arboretum is established. Provisions which are definitely being made are: (1) an area for the exhibition and study of important North American plant associations typical of other regions; (2) a display area on which to conduct adaptability trials of introduced plants which may become valuable additions to the introduced flora of the state, such areas to be completely buffeted and separated from the indigenous plantings; (3) as other areas become available by future additions to the Arboretum, the transition stages between the original or primitive landscape and the present-day conditions will be illustrated; (4) in the arrangement of plants, the natural groupings will be given preference over the museum type of taxonomic arrangement.

In the development of the area, the drives have been and will continue to be limited. Only the necessary circulation and the parking areas for the care and study of the area will be provided. Access should be chiefly by trails and paths, inasmuch as automobiles and motors defeat many of the purposes for which the Arboretum is established.

Character of the Area

The Arboretum and Wild Life Refuge consists of approximately 600 acres. It is hoped that new lands which are much needed will be acquired from time to time, so that the Arboretum may eventually include approximately 1,200 acres. The nature of the area is such that it gives almost unlimited possibilities. The terrain varies from good-sized hills to open prairies and marshes. There is a wide range of soils and exposures. The land lies just south and west of Lake Wingra, within sight and easy walking distance of the University. There are many springs and several small streams, which, together with the lake, give unusual opportunity for water gardens, for the study of aquatic plants, water birds, water insects, and fish. The area for many years past has been the favorite collecting ground of students in entomology.

About 80 acres of the area are primitive woodland, part of which had been pastured. Some portions of the woodland had been ungrazed for a period of twenty years. As will be seen from the aerial views, part of the land has been agricultural land. It is bordered on the west by the Nakoma Country Club, a 100-acre golf course; on the south by a public highway; on the east by some farm land; and on the north by Lake Wingra and the city of Madison.

Projects and Plans

Considerable work has been done in the past two years by relief and CWA labor to make the area more available and more useful to the students. A graveled road has been completed through the Arboretum. The springs have been restored to their natural state, and a council ring has been constructed for the use of classes and other groups.

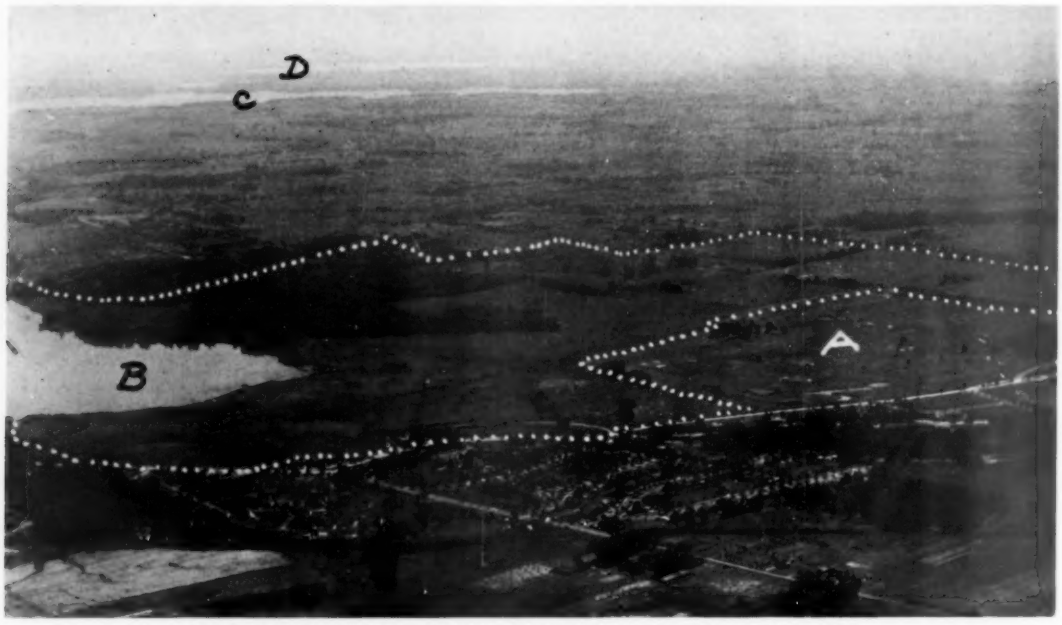
One of the interesting projects under way is the development of a typical Wisconsin prairie. There were a number of open prairie areas throughout Wisconsin when the original settlers came into the country, but these were soon taken over as farm land. A prairie area type is now being developed. It is centrally located and will be provided with a natural woodland border.

Two ponds are almost completed, and a planting of tamarack trees has been established near one of the ponds. This will give a good start toward a Tamarack Association.

Plans are now under way to have further development carried on through the organization of the Emergency Conservation Work. The area is in need of enclosure, lecture halls, offices, and laboratory quarters for students and research assistants. The Arboretum is already being used as an outdoor laboratory by students of botany, zoology, entomology, and landscape design. The students in civil engineering have completed a thorough topographical survey and have located and mapped the many interesting Indian effigy mounds. A detailed soil survey has been made by the students of soils. Plans are now under way for the development and planting of the lagoons and pools, and for the planting of several ecological groups.

Prof. Aldo Leopold has been appointed Director of Research. His services are made available through funds from the Wisconsin Alumni Research Foundation. Prof. G. William Longenecker has been appointed Executive Director of the Arboretum and Wild Life Refuge. Under Professor Leopold's direction, shelter and feeding stations for the many game birds have been established, and several scientific studies are already under way. Recently, areas have been added which make possible the extension of lagoons and other features which will contribute materially to suitability of the area for a wild life refuge.

More than 1,500 evergreens have been planted, and extensive plantings of lilacs have been established in the display area.



LOOKING SOUTHEAST TOWARD LAKE KEGONSA, TWELVE MILES AWAY
A.—Country Club; B.—Lake Wingra; C.—Lake Waubesa; D.—Lake Kegonsa

Importance of Long-Time Planning

The Committee and the administrative officers having charge of the development of the Arboretum are profiting by the long-time plans which have been worked out by the late Dr. Sargent for the Arnold Arboretum. It was Dr. Sargent's opinion that at least a century should be used for the pursuit of research studies in the direction of an arboretum. The value of long-time planning and a long-time research program in the development of arboreta is set forth in Dr. Sargent's last will and testament. He provided that his bequest for the library should be kept intact for 200 years and then used as a library endowment fund. In his plea for adequate funds and guaranteed income, he pointed out that "observation and study of trees, to be of highest value, must often extend over a period of 300 years." His dream was finally realized when he carried through "an arrangement for the firm establishment of the Arboretum which would provide for its continuity for a thousand years and then be renewed for another thousand years, and so on forever."

An Inspirational Undertaking

The University of Wisconsin Arboretum and Wild Life Refuge was dedicated June 17, 1934. The main address was given by John Nolen, city and regional planner, of Cambridge, Mass. It is also of interest that Dr. Nolen was chosen to give the address because he was responsible for giving the arboretum movement impetus in Madison through his Madison City Plan Report of 1910. He closed his address with the following significant sentences:

"The city government of Madison and the people of the city and of the state of Wisconsin have never been unmindful of Madison's beauty. However, order and beauty, after all, are endless quests, and their standards rise higher and higher. The acquisition and occupancy of this land on the shores of Lake Wingra for an Arboretum and Wild Life Refuge insures that it will always be beautiful as well as useful. Furthermore, the University's Arboretum may readily prove to be of more influence in spreading beauty throughout the state than any other single institution. Dr. Robert A. Harper, Professor of Botany of Columbia University, in his address a year ago at the dedication of the Morris Arboretum in Philadelphia, said: 'If in this new world the next century is to repair the physical, biological, and esthetic wastes of three centuries since our stern Puritan forbears landed at Plymouth Rock and began to subdue nature to their needs of liberty, it is high time we were about it; and one of the hopeful signs that the new generation takes its big new job seriously is the creation of such foundations as this Morris Arboretum.'

"Finally, there is an incontestability about beauty which makes argument in its defense almost impertinence. For beauty is the most unforgetable thing in the world; therefore he who adds to the beauty of the world is of the sons of God."

LANDSCAPE ARCHITECTS
FOR UNIVERSITY AND SCHOOL PROJECTS

The following directory is restricted to Landscape Architects who are in independent professional practice and have actually been identified with a number of university or school projects.

Space limitations permit only three listings for each individual or firm, and preclude mentioning either the name of the architect associated or the definite character of the work undertaken for each institution. It is believed that the majority of landscape architects specializing in school and university work are here represented, and that many of the projects listed have had a considerable influence on high-grade professional practice in the planning and planting of school grounds and college campuses throughout the United States.

CALIFORNIA

Wilbur D. Cook, 4025 W. 25th St., Los Angeles
(formerly Cook, Hall & Cornell)
Territorial School, Honolulu, Hawaii
Honolulu College, Honolulu, Hawaii
Pomona College, Claremont

Ralph D. Cornell, 3723 Wilshire Blvd., Los Angeles
(formerly with Cook, Hall & Cornell)
Pomona College, Claremont
Claremont Colleges, Claremont
University of Hawaii, Honolulu

Howard F. Gilkey, 2701 Van Ness Ave., San Francisco
Mills College, Oakland
Saint Mary's College, Moraga
Modesto Junior College, Modesto

John William Gregg, University of California, Berkeley
Campus development for the University of California at Berkeley, Los Angeles, Riverside, Davis, La Jolla and U. C. Hospital, San Francisco

H. W. Shepherd, 101 Agriculture Hall, Berkeley
Union High School and Junior College, Marysville
Branch College of Agriculture, Davis
Round Valley Union High School, Covelo

Ralph T. Stevens, 116 E. Sola St., Santa Barbara
University of California, Berkeley
Santa Barbara Public Schools, Santa Barbara
State Teachers College, Santa Barbara

Butler S. Sturtevant, Shreve Bldg., San Francisco
University of Washington, Seattle
Principia College, Elsah, Ill.
Principia School, St. Louis, Mo.

Paul G. Thiene, 705 Bradford St., Los Angeles
Alhambra High School, Alhambra
Santa Maria Union High School, Santa Maria
Excelsior Union High School, Norwalk

COLORADO

S. R. DeBoer, 515 E. Iliff Ave., Denver
Colorado Womans College, Denver
Ovid High School, Ovid
Wyoming State Training School, Lander

CONNECTICUT

Thomas H. Desmond & Associates, Inc., P. O. Box 208, Simsbury
U. S. Coast Guard Academy, New London
Ethel Walker School, Simsbury
Westminster School, Simsbury

DISTRICT OF COLUMBIA

Joseph C. Gardner, 1700 I St., N.W., Washington
Woodrow Wilson High School, Washington
McKinley Senior High School, Washington
Horace Mann School, Washington

Rose Greely, 1707 I St., Washington
Madeira School, Greenway, Va.
Hillcrest-Washington City Orphanage
New York Military Academy, Cornwall-on-Hudson, N. Y.

FLORIDA

Frank M. Button, 913 Avenue Majorca, Coral Gables
University of Vermont, Burlington, Vt.
Ponce de Leon High School, Coral Gables
Millikin University, Decatur, Ill. (Partner of Simonds Co.)

Herbert L. Flint, Woolworth Bldg., Orlando
Mount Union College, Alliance, Ohio
Newport School, Ironwood, Mich.
Rollins College, Winter Park

ILLINOIS

Jacob L. Crane, Jr., Wrigley Bldg., Chicago
Lawrence College, Appleton, Wis.
High School, Ponca City, Okla.
Chicago Board of Education (64 schools)

Chance S. Hill, 1333 Maple Ave., Downers Grove
North Central College Campus, Naperville
Northern Illinois State Teachers College, DeKalb
Maine Township High School, Des Plaines

Simonds, West & Blair, 1101 Buena Ave., Chicago
Bethany College, Bethany, W. Va.
Iowa State College, Ames, Iowa
Deerfield-Shields High School, Lake Forest

F. A. Cushing Smith & Associates, 175 W. Jackson Blvd., Chicago
St. Agnes School, Albany, N. Y.
Rockford College, Rockford
Medical and Dental College, University of Illinois, Chicago

INDIANA

Lawrence V. Sheridan, Brendonwood, Indianapolis
Purdue University, Lafayette
St. Mary of the Woods Academy, Terre Haute
Shortridge High School, Indianapolis

MAINE

Beatrix Farrand, Reef Point, Bar Harbor
Yale University, New Haven, Conn.
Princeton University, Princeton, N. J.
University of Chicago, Chicago, Ill.

MARYLAND

Irving W. Payne, 4017 Leland St., Chevy Chase
Georgetown Preparatory School, Garrett Park
The Miss Madeira School for Girls, Greenway, Va.
Lanham Grade School, Lanham

MASSACHUSETTS

Franklin Brett, Duxbury
Marshfield High School, Marshfield
Weston High School, Weston
Duxbury High School, Duxbury

Laurence S. Caldwell, 45 Bromfield St., Boston
Vassar College, Poughkeepsie, N. Y.
Bates College, Lewiston, Maine
Belmont High School, Belmont

Herbert J. Kellaway, 12 West St., Boston
Amherst College, Amherst
North Junior High School, Quincy
Wilton Public School, Wilton, N. H.

Warren H. Manning, 210 Brattle Bldg., Cambridge
Virginia Polytechnic Institute, Blacksburg
Randolph-Macon Woman's College, Lynchburg, Va.
Massachusetts State College, Amherst

Olmsted Brothers, 99 Warren St., Brookline
Phillips Academy, Andover
Denison University, Granville, Ohio
Duke University, Durham, N. C.

Arthur A. Shurcliff, 11 Beacon St., Boston
Amherst College, Amherst
Wellesley College, Wellesley
College of William and Mary, Williamsburg, Va.

Frank A. Waugh, Amherst
Massachusetts State College, Amherst
Kansas State Agricultural College, Manhattan, Kans.
New York State Experiment Station, Geneva, N. Y.

Joseph F. Whitney, Falmouth
Engineering Court, University of Cincinnati
School Group, Falmouth
Grade and High School, South Dennis

MICHIGAN

T. Glenn Phillips, 2033 Park Ave., Detroit
Michigan State College, East Lansing
Sacred Heart Seminary, Detroit
University of Detroit, Detroit

H. O. Whittemore, University of Michigan, Ann Arbor
Nichols Arboretum, University of Michigan
Ann Arbor Public Schools
Hematite Township Schools, Amasa

MINNESOTA

Hugh Vincent Feehan, 1004 Marquette Ave., Minneapolis
Villa Duchesne, St. Louis, Mo.
Holy Rosary School, Duluth
High School Athletic Fields, Rochester
Morell & Nichols, Inc., 1200 Second Ave., South, Minneapolis
University of Minnesota, Minneapolis
Washington State College, Pullman
Carleton College, Northfield
Charles H. Ramsdell, 839 Metropolitan Life Bldg., Minneapolis
High School Athletic Field, Springfield
Rochester Schools, Rochester
Stout Institute, Menomonie, Wis.

MISSOURI

Hare & Hare, 114 W. 10th St., Kansas City
University of Texas Campus, Austin
High School, Kansas City, Kans.
53 Schools, Fort Worth, Texas
John Noyes, Railway Exchange Bldg., St. Louis
Mary Institute, St. Louis Co.
St. Louis Country Day School, St. Louis Co.
Webster Groves High School, Webster Groves

NEW JERSEY

Brinley & Holbrook, 21 South St., Morristown
Trenton Teachers College, Trenton
N. J. Training School for Colored Youth, Bordentown
Teachers College, Montclair
Marjorie Sewell Cautley, Ridgewood
Fieldston School Campus, Riverdale, N. Y.
Tenafly High School Grounds, Tenafly
Roosevelt Common Athletic Field, Tenafly

NEW YORK

Briggs & Stelling, 10 E. 40th St., New York (also Charleston, S. C.)
Quogue Grade School, Southampton
Elementary, Junior and Senior High School Tannersville
Junior and Senior High School, Dobbs Ferry
A. F. Brinckerhoff, 101 Park Ave., New York
Connecticut College, New London
Bronxville School, Bronxville
Trinity College, Hartford, Conn.
Harold A. Caparn, 144 E. 30th St., New York
Lebanon Valley College, Annville, Pa.
Union Free School, Dist. No. 6, Manhasset
Brooklyn Botanic Garden, Brooklyn
Byrant Fleming, Ithaca (also Wyoming, N. Y.)
Cornell University, Ithaca
Ithaca Heights School, Ithaca
Toronto University, Toronto, Canada
Francis Hastings Gott, 311 Alexander St., Rochester
Nazareth Convent and Academy, Pittsford
Central School, District No. 1, Brockport
Charlotte High School, Charlotte
Harries & Reeves, 110 Franklin St., Buffalo
3 Schools, Little Falls
Dolgeville High School, Dolgeville
Athletic Field, Lockport
Frederic C. Hoth and Paul B. Schumm, 5 Columbus Circle, New York
St. Cecelia High School, Englewood, N. J.
Leonia Grammar School, Englewood, N. J.
St. Vincent de Paul Parochial School, Bayonne, N. J.
Charles Downing Lay, 101 Park Ave., New York
High School, Watertown, Conn.
Union College, Schenectady
New York State Normal Training School, Cortland
H. B. Littlefield, "Little Field," North White Plains
Central High School, Hancock
High School of White Plains, and Stadium, White Plains
Battle Hill School, White Plains
Charles N. Lowrie, 101 Park Ave., New York
Yale University Athletic Fields, New Haven, Conn.
Lawrenceville School, Lawrenceville, N. J.
Oyster Bay Junior High School, Oyster Bay
Richard Schermerhorn, Jr., 342 Madison Ave., New York
Union College, Schenectady
St. Anthony's Seraphic Seminary, Catskill
Albany Academy, Albany
Jacob John Spoon, Inc., 156 Grand St., White Plains
Academy of St. Joseph-in-the-Pines, Brentwood
Penn. Township School Dist. High School Grounds, Bernville, Pa.
Central School District No. 1, Pine Plains
Vitale & Geiffert-Gilmore D. Clarke, 101 Park Ave. New York
University of Illinois, Urbana
Virginia Military Institute, Lexington
New Jersey College for Women, New Brunswick

NORTH CAROLINA

E. S. Draper Associates, 1522 E. 4th St., Charlotte
Winthrop College, State College for Women, Rock Hill, S. C.
Lanier Memorial School, Langdale, Ala.
Agnes Scott College, Decatur, Ga.

OHIO

William Pitkin, Jr., & Seward H. Mott, Inc., 3866 Carnegie Ave., Cleveland
University of Michigan, Ann Arbor
Rochester University, Rochester, N. Y.
College of Wooster, Wooster
A. D. Taylor, 4614 Prospect Ave., Cleveland
Oregon State College, Corvallis
Kent State Normal College, Kent
Carnegie Institute of Technology, Pittsburgh, Pa.
B. Ashburton Tripp, 821 Guarantee Title Bldg., Cleveland
High School, Parkersburg, W. Va.
High School, Shaker Heights
High School, Cleveland Heights

PENNSYLVANIA

Wheelwright & Stevenson, 225 South 15th St., Philadelphia
The Gunnery School, Washington, Conn.
St. Andrews School, Middletown, Del.
Muhlenberg College, Allentown

VIRGINIA

A. A. Farnham, 1240 White Oak Road, Roanoke
Hollins College, Hollins
Sweet Briar College, Sweet Briar
Virginia Polytechnic Institute, Blacksburg
Charles F. Gillette, 105 E. Cary St., Richmond
College of William and Mary, Williamsburg
Jesuit Novitiate School, Wernersville, Pa.
Mary Baldwin College, Staunton

WISCONSIN

Phelps Wyman, 759 North Milwaukee St., Milwaukee
State Industrial School for Girls, Oregon
State Teachers College, Milwaukee
South Dakota School of Mines, Rapid City

CANADA

Arthur M. Kruse, 50 High Park Blvd., Toronto, Ontario
The Boys' Training School, Bowmanville, Ontario
Woodstock College, Woodstock, Ontario
Belleville Institution for the Deaf, Belleville, Ontario

THE COLE NURSERY COMPANY

Introducers of Truehedge Columnberry

Painesville, Ohio

ESTABLISHED 1881

Beautify Your School Grounds with TRUEHEDGE COLUMNBERRY

Common Barberry — New Truehedge Columnberry

Here, at last, is a hedge as beautiful as boxwood, which it closely resembles, and as hardy as the common Japanese barberry. First introduced in July, 1934, it has been much sought after by school and college executives, as well as park superintendents, landscape architects and others interested in beautifying public grounds or private estates.

Truehedge Columnberry was discovered and developed by M. H. Horvath, Landscape Architect, who found one day a form of Berberis Thunbergi pluriflora with a strong tendency toward erect growth. He picked the seed from this plant, and from the seedlings grown, selected the most upright types from which he again picked the seed. This process was repeated until the fifth generation, wherein Mr. Horvath found the perfect, spire-like plant that he was seeking.

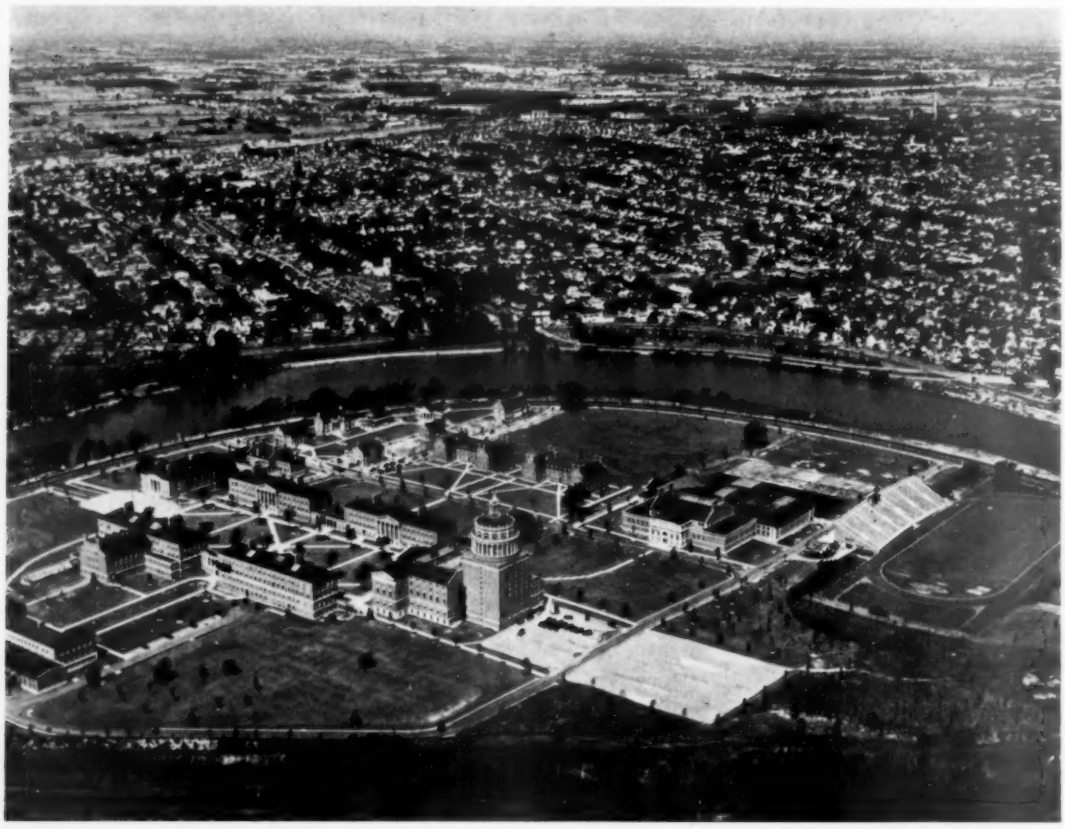
Truehedge Columnberry is as beautiful as boxwood, considerably lower in price, and infinitely more hardy. It is particularly welcomed in the north because it withstands severe weather conditions so admirably. It rapidly attains mature size, forming a dense hedge of glossy, deep green foliage. It may be quickly trimmed to make a formal hedge, or left untrimmed to make an unsurpassed semi-formal hedge. The density of this plant, as compared with barberry, is almost unbelievable.

Plants are available at any of the following nurseries, or may be ordered direct from the Cole Nursery Company:

Adams Nursery, Inc., Springfield, Mass.
Bay State Nurseries, Framingham, Mass., and North Abington, Mass.
Jackson & Perkins Co., Newark, N. Y.
R. M. Kellogg Co., Three Rivers, Mich.
Lester C. Lovett, Little Silver, N. J.
Henry A. Dreer, Inc., Philadelphia, Pa.
I. E. Ilgenfritz' Sons Co., Monroe, Mich.
Shenandoah Nurseries, Shenandoah, Iowa
E. D. Smith & Sons, Ltd., Winona, Ontario
Storrs & Harrison Co., Painesville, Ohio

ILLUSTRATED BOOKLET
ON REQUEST

Picture of TRUEHEDGE COLUMNBERRY taken immediately after first trimming, which consumed about thirty minutes per row with hedge shears; plants three years old; June, 1935



UNIVERSITY OF ROCHESTER

College for Men

Rochester, N. Y.

For a mile, the campus of the University of Rochester's College for Men fronts on the Genesee River. The eighteen buildings, compactly and attractively arranged in a bend of the river, include eleven college buildings and seven fraternity houses, the architecture of all being uniformly Colonial.

The 85-year-old institution completed and dedicated its new College for Men in 1930. In the construction of the driveway system, the Texaco Asphalt Macadam type of surface was used throughout, with the exception of a small yardage of Texaco Sheet Asphalt.

THE TEXAS COMPANY

ASPHALT SALES DEPARTMENT

135 East 42nd Street, New York City

New York
Philadelphia
Richmond
Buffalo
Boston

Jacksonville
Chicago
Cleveland
Kansas City
Dallas
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TEXACO ASPHALTIC PRODUCTS

a variety of surfaces for drives, playgrounds, walks, tennis courts, etc.

(1) Sheet Asphalt: Most durable type of asphalt pavement. Designed for very heavy traffic. 25-year-old Sheet Asphalt is common. Maintenance cost extremely low.

(2) Asphalt Macadam: Also a heavy-duty type, but lower in cost than Sheet Asphalt. An ideal surface for main college and university drives. Many years' service. Low upkeep.

(3) Road-mix: A low cost surface, ideal for medium traffic roads and for playgrounds. Smooth, firm, non-skid; thousands of miles serve country's secondary roads.

(4) Surface-treatment: A thin, tough, waterproof mat, suitable for one or two seasons. Offers an inexpensive and temporary method of eliminating dust and mud.

ANCHOR POST FENCE COMPANY

Complete Line of Fences and Playground Equipment

Baltimore, Md.

Sales Offices in Principal Cities

ANCHOR FENCES FOR SCHOOLS AND SCHOOL PLAYGROUNDS

The Anchor Post Fence Company has been serving public schools and colleges, municipalities and industrial plants with fencing and playground equipment to suit their various requirements for nearly half a century.

Anchor Chain Link Fences

Makers of America's first chain link fence, the Anchor Post Fence Company today manufactures a complete line, and will be glad to supply any interested school executive or architect with a copy of our Chain Link Fence Catalog containing full information about the four exclusive features which make an Anchor Chain Link Fence exceptionally attractive and durable. **Ask for Catalog No. 89.**

Anchor Drive-Anchorage

Anchor-Weld Iron Fences and Gates

Through the exclusive Anchor-Weld method of construction, the Anchor Post Fence Company is able to manufacture iron fences and gates which equal in appearance many expensive hand-wrought products. Many schools throughout the country are today justly proud of their beautiful Anchor-Weld Ornamental Iron Fences and Gates. Some of these are to be found illustrated in our **Catalog No. 83.**

Anchor's Four Exclusive Features

1. **ANCHOR-WELD WIRE GATE**—built with a frame of square tubular steel—arc-welded at the corners. The square shape of the heavy steel tubing, together with the welding of the corners, provides a framework of such exceptional strength that no reenforcing diagonal braces are needed. We claim that this is the strongest and most attractive wire gate made.

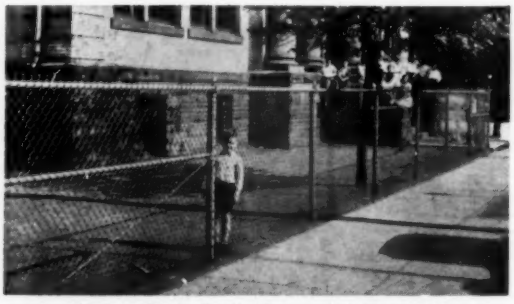
2. **SQUARE TERMINAL POSTS**—stronger because they are square in section. More protective—having no fabric-holding bands and therefore providing no footholds for climbing. Better-looking—because of their graceful lines.

3. **U-BAR LINE POSTS**—made of high carbon steel and U-shaped in section to insure maximum strength.

4. **DRIVE-ANCHORAGE**—grips the soil like the roots of a tree. We have imitated nature's engineering by providing the line posts with a broad foundation. Anchor drive-anchors defy thaws, frosts and the many other strains to which a fence is subjected.

Note: While we strongly advocate the drive-anchor method of setting posts, we can, if desired, set our posts in concrete footings when conditions warrant such a procedure.

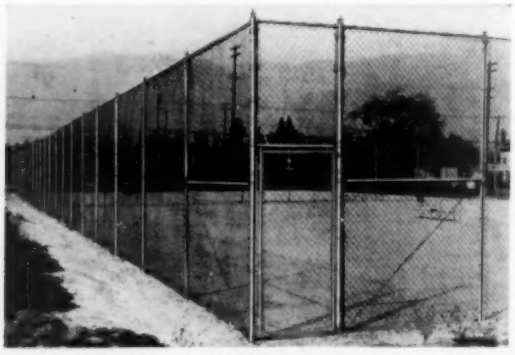
Anchor-Weld Wire Gate



Anchor Chain Link Fence with Top Rail Public School, Pittsburgh, Pa.

Anchor U-Bar Line Post

Anchor Square Terminal Post



Anchor Chain Link Tennis Court Enclosure at Pasadena High School, Pasadena, Calif.

Anchor-Weld Fence Surrounding the Hartford High School, Hartford, Conn.

THE COLUMBIA ALKALI CORP.

Manufacturers of

Columbia Calcium Chloride, Columbia Alkalies

Factories and General Offices: Barberton, Ohio

BRANCH SALES OFFICES

30 Rockefeller Plaza, New York
431 St. Clair Street, Chicago
Carew Tower, Cincinnati
Grant Building, Pittsburgh

DUST LAYING

Those in charge of maintenance of lawns, driveways, playgrounds and tennis courts are borrowing from the experience of highway people in combating the dust problem. It is now standard practice among highway engineers to spread calcium chloride on gravel roads to control the dust. And it has become common practice to treat the private driveways of our schools and universities with calcium chloride. Two purposes are accomplished: First, valuable road surface materials are kept slightly moist and compact and are thus prevented from drying out and being ground to dust by traffic and blown away. Second, the elimination of the dust nuisance creates healthier conditions and at the same time prevents the spreading of dust on lawns, flower gardens and shrubberry, a factor that detracts from their healthy growth and beauty.

Columbia Calcium Chloride comes in 100 lb. sacks and 400 lb. drums. It is an inexpensive, white flaky material that is easily applied with a small spreader. One pound per sq. yard of surface will lay the dust for a season. Stocks of Columbia Calcium Chloride are carried by building supply dealers in many cities.

ICE CONTROL

That it is wise to keep a stock of Columbia Calcium Chloride on hand is proven by its utility for ice control in Winter. Spread on icy steps, frozen drains and icy driveways, particularly intersections, it thaws ice quickly, brings quick relief and often prevents serious damage.

For longer stretches of driveway and for icy hills and intersections it will be found practical to saturate piles of sand or cinders with a solution of calcium chloride and spread these gritty materials on the ice. The calcium chloride coating on each particle melts enough of the ice to imbed it firmly in the ice, thus giving good traction where it is badly needed.

For further facts on dust control or ice control with Columbia Calcium Chloride, you are invited to write us for complete descriptive literature.

CONTINENTAL STEEL CORPORATION

Manufacturers of Chain Link Fence for All Purposes

GENERAL OFFICE: Kokomo, Indiana

Operating Plants: Kokomo, Indianapolis, Canton

Sales Offices in All Principal Cities

5 NEW CONSTRUCTION FEATURES

ENGINEERED FOR PERMANENCE, MADE FROM COPPER-BEARING WIRE, HOT DIP GALVANIZED AFTER WEAVING

Many new features make Continental Chain Link Fence **an outstanding fence value.** Improved methods of galvanizing the wire **after weaving,** insure a heavier, more uniform coating of zinc, which resists corrosion many years longer. Full copper-bearing steel (.20 to .30 per cent copper) gives additional protection against rust. All parts and fittings are made of long lasting materials and are **hot dip galvanized.**

CONTINENTAL
TRADE MARK REG U S PAT OFF
Chain Link
FENCE
OFFERS LOWER COST PER YEAR OF SERVICE

HEAVIER AND STRONGER POSTS, PARTS AND FITTINGS AMONG NEW CONSTRUCTION FEATURES

New H-Section line posts weigh 4.3 lbs. per ft. and are spaced not more than 10 ft. apart on centers, and set in concrete footings. Heavy malleable iron post tops, which fit over line posts, provide for either top rail or tension wire. Top rails are tubular steel pipe 1⅝-in. outside diameter, weighing 2.28 lbs. per ft., and are provided with 7-in. long inside and outside expansion sleeve couplings.

All parts and fittings are of highest quality materials throughout.

FROM 20% TO 50% MORE FABRIC TIES THAN ORDINARY FENCE—AND ALL TIES RUSTPROOF

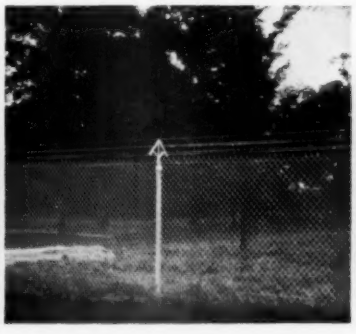
No. 9 or 6 full gauge wire with not less than 1.2 oz. of zinc per sq. ft., with tensile strength of over 85,000 lbs. per sq. in., is standard in all Continental specifications. Six No. 6 gauge, round, rustproof fabric ties are furnished for each 10 ft. of rail, and one to each foot of line post height.

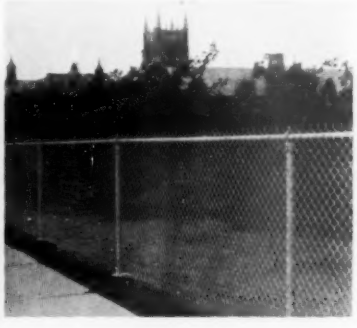
NEW TENSION LOCKING PIN ELIMINATES ALL BOLTS AND NUTS

In addition to the new exclusive locking pin which holds fabric to terminal posts, Continental also provides an improved pivot type hinge which insures perfect operation of gates without any maintenance. On barb wire styles, the barb wire is attached to post arms in angle slot, being automatically locked in position.

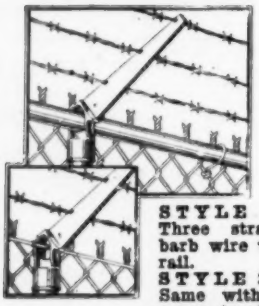
FOR ATHLETIC FIELDS AND SCHOOL GROUNDS

Continental Chain Link Fence is the modern protection for school grounds, athletic fields and institutions where complete protection of grounds and buildings, control of crowds, etc., is needed. Its permanence makes its annual cost exceedingly low. Your investigation on a point-by-point check up of its engineering features is invited. Send for literature and complete specifications for your files.

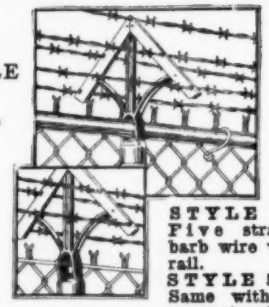




A STYLE TO MEET

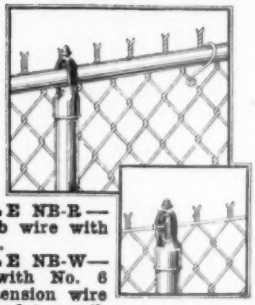


STYLE 3B-R—Three strands of barb wire with top rail.
STYLE 3B-W—Same with No. 6 gauge tension wire instead of top rail.



STYLE 5B-R—Five strands of barb wire with top rail.
STYLE 5B-W—Same with No. 6 gauge tension wire instead of top rail.

EVERY FENCING NEED



STYLE NB-R—No barb wire with top rail.
STYLE NB-W—Same with No. 6 gauge tension wire instead of top rail.

CYCLONE FENCE COMPANY

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

General Office: Waukegan, Illinois

FACTORIES—North Chicago, Ill. Waukegan, Ill. Cleveland, Ohio. Newark, N. J. Fort Worth, Texas. Greensburg, Indiana. Tecumseh, Mich. De Kalb, Ill.

Pacific Coast Division

STANDARD FENCE COMPANY

Los Angeles San Francisco Oakland, Calif. Portland, Ore. Seattle, Wash.

Cyclone is not a "type" of fence but is fence made exclusively by Cyclone Fence Company and identified by this trade-mark.

Cyclone Fence is produced and erected by the world's largest manufacturers of property protection fencing. For years the Cyclone Fence Company has specialized in fencing school property. Cyclone Fence is the recognized standard for every school and playground purpose.

FIG. 1—CYCLONE SAFEGUARD CHAIN LINK FENCE FOR SCHOOL GROUNDS, PLAYGROUNDS, PARKS, INSTITUTIONS, ETC.

FIG. 2—CYCLONE INVINCIBLE CHAIN LINK FENCE FOR ATHLETIC FIELDS

Learn how to test the value of any chain link fabric **before you buy.** Ask for the Cyclone "12m" folder.

Enclose your school grounds with genuine Cyclone Fence to provide maximum protection for your school children.

Fence your school Athletic Field with Cyclone and get more paid admissions to every game.

Because of its long, trouble-free service, you will find Cyclone Fence most economical in the end.

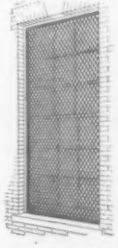


FIG. 3 — CYCLONE WINDOW GUARD

FIG. 4 — CYCLONE TENNIS COURT BACKSTOPS

GRAVELY MOTOR PLOW & CULTIVATOR COMPANY

Box 414, Dunbar, W. Va.

GRAVELY SICKLE MOWER

A New Type Mower That Improves the Appearance of Your Property While Reducing Mowing Cost

Use the Gravely Sickle Mower for the rough spots . . . vacant lots full of cans and wire . . . along sidewalks and steep banks.

Use it in places where you can't take any other type mower and have had to cut with scythes in the past.

The sturdy GRAVELY with its patented SWIVEL ACTION Sickle type Bar, and single wheel traction will go anywhere . . . Cuts the weeds or grass regardless of height.

Let us tell you more about this new type machine . . . How it will reduce your mowing costs and improve appearances at the same time.

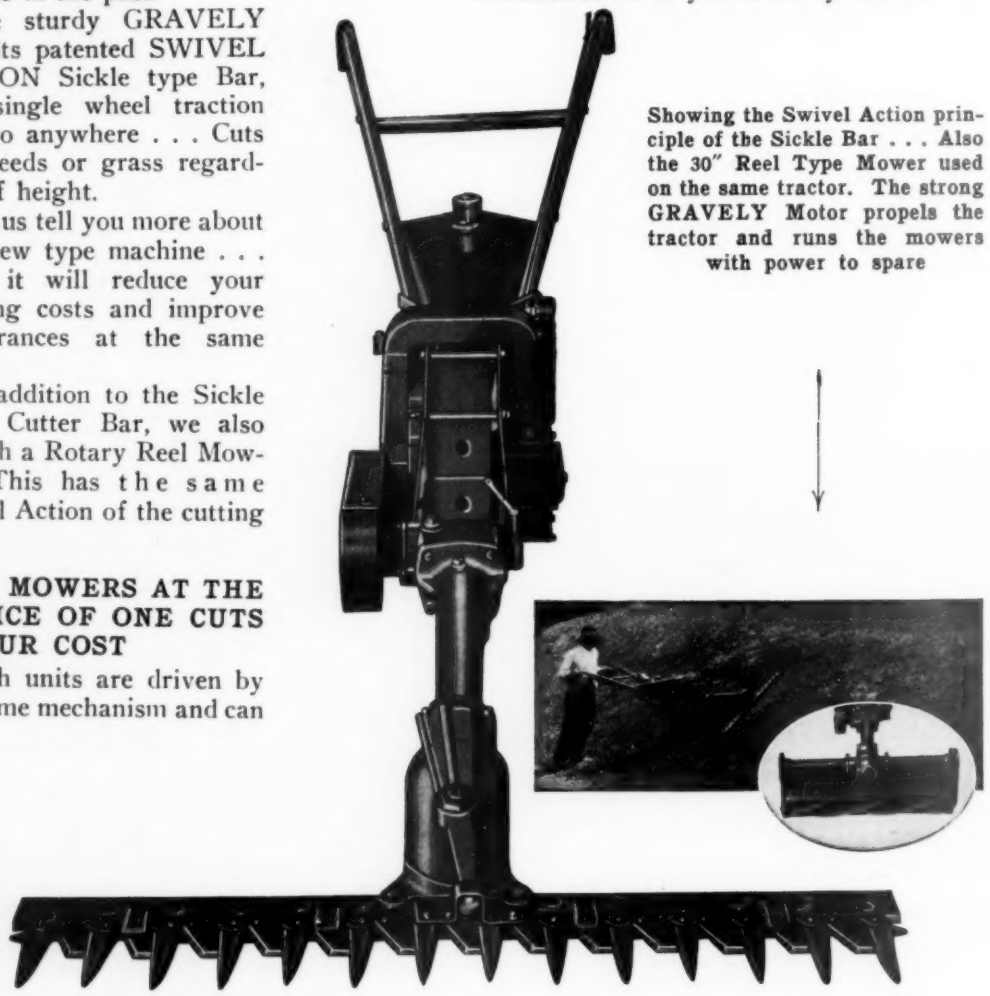
In addition to the Sickle Type Cutter Bar, we also furnish a Rotary Reel Mower. This has the same Swivel Action of the cutting bar.

TWO MOWERS AT THE PRICE OF ONE CUTS YOUR COST

Both units are driven by the same mechanism and can be changed in a few minutes by removing four bolts.

A DEMONSTRATION COSTS NOTHING

Write us for further information, or a demonstration if you're ready for it.



Showing the Swivel Action principle of the Sickle Bar . . . Also the 30″ Reel Type Mower used on the same tractor. The strong GRAVELY Motor propels the tractor and runs the mowers with power to spare

IDEAL POWER LAWN MOTOR CO.

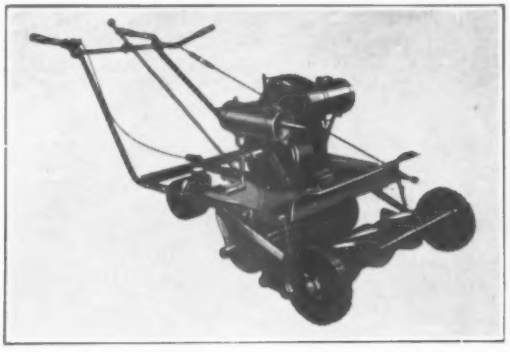
438 Kalamazoo Street, Lansing, Mich.

FACTORY BRANCHES

New York
12 Harrison St., New Rochelle, N. Y.

Detroit
161 Vester Ave., Ferndale, Mich.

A COMPLETE LINE OF ROLLER TYPE AND WHEEL TYPE POWER MOWERS, TRACTOR MOWERS AND GANG MOWERS



IDEAL "MASTER"—Roller Type
Two Sizes—25″ cut, 30″ cut

A combination power mower and roller of simple design and extra sturdy construction for heavy duty service. Well adapted to large open areas where continuous hard daily service is encountered, and where long life and low upkeep are essential.

Extra equipment—Trailer Units (on 30″ model) —Riding Sulky, Grass Catcher.

IDEAL "VICTOR"—Wheel Type
Two Sizes—22″ cut, 30″ cut

The Victor model wheel type mower is made in two sizes. A light weight, easy handling machine recommended for use on lawns where there is a large amount of close cutting around trees, shrubbery, etc. Available with steel wheels or air tires.

Extra equipment—Weed Cutter, Grass Catcher; and on 30″ size Riding Sulky, Trailer Units.

IDEAL "MAJESTIC"—Roller Type
Two Sizes—22″ cut, 30″ cut

A roller type mower with power driven reel—recommended for use on extra fine, smooth lawns where a close, clean high quality cutting job is demanded. Used extensively on lawns of Creeping Bent and Bermuda. Close coupled, compact and easily handled around shrubbery, flower beds, etc.

Extra equipment—Weed Cutter, Grass Catcher; and on 30″ size Riding Sulky, Trailer Units.

IDEAL POWER TRIPLEX
Junior Model 70″ cut—Senior Model 84″ cut

For mowing jobs where big capacity is demanded the Ideal Triplex has no equal. Capacity up to 35 acres per day. Power steered. All three units cut ahead of tractor wheels. Hand lever to lift units off the ground. Quickly and safely transported from one job to another.

Extra equipment — Snow Plow for sidewalks and driveways.

For full Details and Prices, Write for our General Catalog

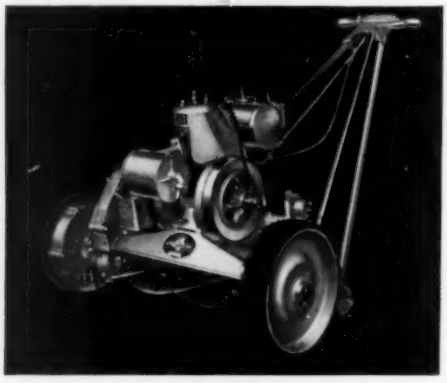
JACOBSEN MANUFACTURING CO.

740 Washington Avenue, Racine, Wisconsin

Power Lawn Mowers for Every Purpose

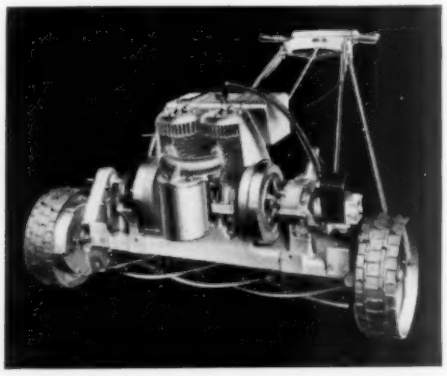
To provide economy in caring for lawns of every character, Jacobsen Power Lawn Mowers are built in both wheel and roller types, with cutting widths ranging from 20 inches to 66 inches and priced from $125.00 up. Each model is designed for a specific type of service by America's foremost power mower engineers.

Jacobsen Power Mowers are now used by schools and universities in all parts of the world for cutting every kind of grass. No matter what type or size lawn you have to cut, you can select a "Jacobsen" that will fit your requirements with the assurance that no other power mower offers such fine engineering, sturdy construction, efficient performance and economical operation.



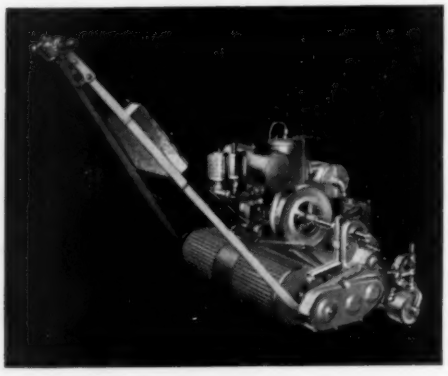
"4-ACRE"

Because of its extreme simplicity, rugged design and low cost of operation, the new Jacobsen heavy duty "4-Acre" is the choice of leading schools and institutions. Slow speed, single cylinder motor of 1½ H.P. Operating speed 900 r.p.m. at 3 miles per hour. Cutting widths 24 and 30 inches. Capacity 4 to 6 acres per day. Furnished with rubber tired or steel wheels.



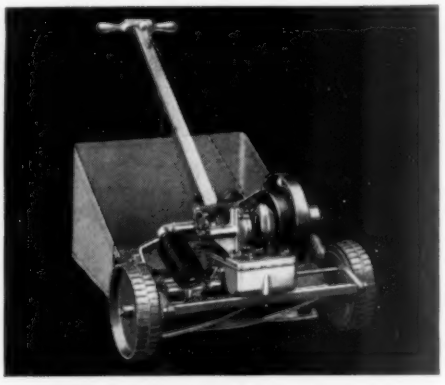
"TWIN"

The new Jacobsen "Twin" provides big acreage mowing with low labor and operating cost. It has a 32-inch cutting width to which can be added two 18 inch units giving a capacity up to 20 acres a day. Slow speed twin-cylinder motor, with two speed transmission, develops 3½ H.P. Operating speed 1,000 r.p.m. Ample power to operate auxiliary units and riding sulky.



"ESTATE"

For real fine lawns that require frequent, but gentle rolling, the Jacobsen roller-driven "Estate" stands supreme. The large traction roller protects the delicate turf, massaging it with each cutting. The differential is located between the sections of the rear roller. Equipped with powerful, single cylinder motor. Made in 20-, 24- and 30-inch cutting widths.



"SIMPLEX"

The "Simplex" is light in weight and exceedingly easy to handle. For lawns as small as ¼ acre or on those thickly planted with trees and shrubs, it has proved a big time and labor saver. Single cylinder motor of ¾ H.P. at 1,750 r.p.m. Cutting width 20 inches. Will mow 2 or 3 acres a day. The "Simplex" is practical for homes, small parks, and schools.

SEND FOR DESCRIPTIVE CATALOG OF JACOBSEN POWER MOWERS

THE MOTO-MOWER COMPANY

MAIN OFFICE
4600 Woodward Avenue
Detroit, Michigan

TWO OUTSTANDING MODELS--

OF THE *Moto-Mower* LINE

FOR ECONOMICAL AND EFFICIENT PERFORMANCE

THE SUPER-DETROIT

Big and powerful but as responsive to the touch as a light hand-mower through "Twist of the Wrist" guiding. An operator can mow five or six acres a day every day of the season without fatigue. Among other outstanding features are 4-cycle L-head motor, selective automatic speed control, safety clutch, drop-out cutting reel. Also pneumatic tires 15 x 4½ at reasonable extra charge. Write for complete information.

THE LAWNMASTER

Particularly recommended for areas with fine lawns which require trimming of turf along driveways. Mowers may be operated as a trimmer with the cutting reel extended over the edges of the depression. Features include separate clutch for traction and reel, detachable cutting unit, throw-out reel clutch, and safety clutch. 4-cycle L-head, air-cooled motor, etc. Available in 25-30".

OTHER MOTO-MOWER MODELS ARE

Standard model—24" cut; 4-acre daily cutting capacity; iron wheels or pneumatic, 14 x 4; reasonable extra cost.

Super-Detroit with 2 trailer units—66" cut; 12 acres a day cutting capacity.

City model—21" cut; 2 or 3 acres daily cutting capacity.

Standard Heavy Duty model with 2 trailer units: 60" cut; 10 acres a day cutting capacity.

Fleetway—32" cut; includes all desirable features both of a wheel and roller mower. Also available with extra gauge cutting units and sulky.

Junior model—19" cut.

There's a Moto-Mower Dealer Near You

Moto-Mower

Write for Our Complete Catalog of Moto-Mowers

OUTBOARD MOTORS CORPORATION

4143 North Twenty-Seventh Street, Milwaukee, Wisconsin

THE MODERN, ONE-HAND, LOW-COST MOWING MACHINE

More and more schools are finding the answer to their complicated mowing problems in the Lawn-Boy, the modern, one-hand, low-cost, light weight mower. Extremely maneuverable because of its compactness and free-wheeling features, the Lawn Boy is unsurpassed for mowing in congested, uneven, grass and stone-infested areas and easily outmows many larger mowers on open stretches.

CUTS 6″ CLOSER

Lawn-Boy design permits the machine to mow 6 inches closer to curbs, walls, trees and hedges than most hand mowers and power mowers. A twist of the handle locks it for quick cutting with power that does away with costly, laborious hand trimming.

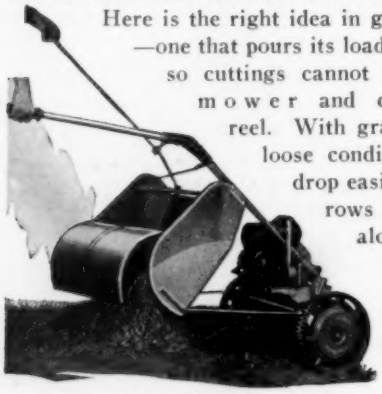
RUNS A DAY ON 20c. WORTH OF FUEL

Lawn-Boy is sturdily built for day-in, day-out heavy mowing. Compact, clever designing keeps weight low, only 95 lbs., resulting in easy handling and low operating cost.

CUTS UNIFORMLY—4 CUTTING HEIGHTS

Lawn-Boy cuts more smoothly in troughs, on crests, up or down hill. Simple wheel adjustment provides ⅝″, 1″, 1⅜″ or 1¾″ cut.

ONE-HAND ALL-METAL GRASS CATCHER



Here is the right idea in grass catchers—one that pours its load out the back so cuttings cannot get into the mower and clog up the reel. With grass in a dry, loose condition cuttings drop easily into windrows as you walk along—without stooping, without detaching the catcher. Price, $8.50.

12 BIG FEATURES

12 unique Lawn-Boy features are shown in our complete catalog-folder. Send for a copy today.

EASY, ONE-HAND MOWING

LAWN BOY Power Mower

The operator needs only to guide the Lawn-Boy with a light carry-grip on the control handle. The instant he pulls back on the handle the mower **stops.** Motor and reel keep on running, but the drive wheels are disengaged. Normal release of the control handle again sets the drive wheels in motion. Operating a Lawn-Boy is so natural that it seems that the mower and operator are one, so perfectly does it obey the hand that guides it. There is no weight on the handle, and there is no side to side jerking. Lawn-Boy mowing is easy one-hand mowing that does not jerk or jar the operator. That is why Lawn-Boys can be operated hour after hour and easily outmow much larger mowers.

AUTOMATIC STOP CONTROL

Occasionally the operator may wish to stop mowing to remove some object in his path. He merely drops the handle . . . Lawn-Boy stops instantly . . . the motor keeps running . . . mowing is resumed by merely returning the handle to normal position. Operation is so simple, so automatic—a mere boy operates the Lawn-Boy easily.

Only $110 Rubber Tires Extra

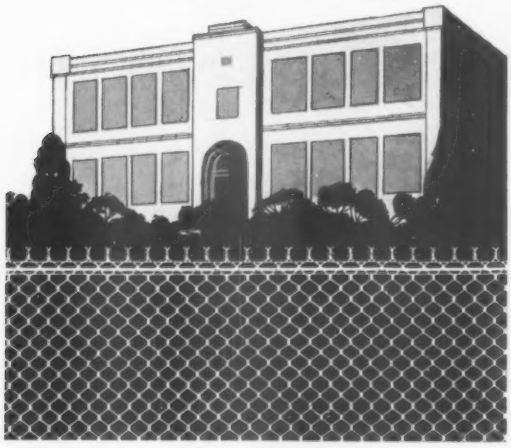
Almost automatic One-Hand Control. Gives new ease of operation.

PITTSBURGH STEEL CO.

Union Trust Building, Pittsburgh, Pa.

New York Chicago San Francisco Philadelphia Los Angeles
Houston Syracuse Detroit Memphis St. Louis

PITTSBURGH CHAIN LINK FENCE . .



. . . *for* SCHOOLS *and* PLAYGROUNDS

Pittsburgh Chain Link is the ideal type of fence for school yard enclosures, playgrounds, athletic fields, swimming pools, tennis courts and for such other installations as require a maximum of strength and long life combined with a maximum of good looks and a full measure of true economy. The main features which go to make Pittsburgh Chain Link Fence outstanding in its field are:

Note: Complete detailed specifications gladly furnished upon request.

1. **THE FABRIC**—which is full-gauge, copper-bearing, open-hearth steel wire, heavily hot zinc coated after weaving. This fabric is available in many weights and mesh-sizes to meet all varieties of service needs.

2. **THE FRAMEWORK**—which combines solid H-Section or seamless steel pipe line posts with copper-bearing seamless steel pipe terminal posts, top rail and gate frames.

3. **THE FITTINGS**—in the design of which have been incorporated every possible feature to make for strength, convenience and ease of application and use. Fence fittings are no mean index of the value of a finished fence job. Expense spared here, although perhaps permitting some play in price, seldom fails to make itself known after a few years of usage. Pittsburgh fittings are all highest quality pressed steel and malleable iron for long service.

4. **THE SERVICE**—which Pittsburgh Steel Company is ready to furnish. If you want complete erection service, we'll provide expert erection men to do your entire job for you. If you prefer to erect your own fence with your own labor, we'll work with you to whatever extent you may need us. Our Engineering Department is set up to act in an advisory as well as a planning capacity.

Pittsburgh Chain Link Fence is the product of more than 30 years of steel and fence manufacturing experience. This Company has always made quality products—and quality products only—under continuous rigid inspection from the ore to the finished materials. You may feel safe in accepting our guarantee of complete satisfaction with any Pittsburgh Product.

Pittsburgh Steel Company also manufactures Ornamental Lawn Fences; Estate, Residential and Industrial Fences; Farm and Poultry Fences; Annealed Wire; Barbed Wire; Galvanized Wire; Spring Wire; Nails; Staples; Welded Wire Reinforcing for Streets, Sidewalks, Highways and General Construction; Pittsburgh Steeltex (wire reinforcing mesh with integral fibrous backing) in styles for Brick, Stucco or Plaster. Please write for further information.

O. M. SCOTT & SONS COMPANY

Marysville SCOTT'S GOLF COURSE SEEDS Ohio

Lawn Care

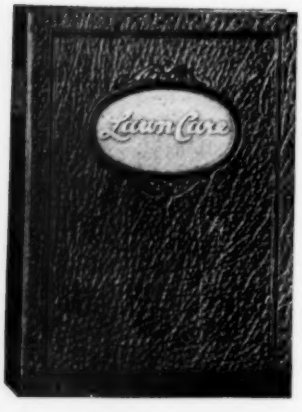
Grass growing presents many and intricate problems—most of which someone has solved.

In a little publication called **Lawn Care** this firm distributes a wealth of information on lawn matters. Much space is devoted to weed and other pest control.

Lawn Care doesn't represent what one or a dozen persons know or think about a certain problem. It is a condensation of the experiences of hundreds of competent authorities and laymen.

If you are not receiving **Lawn Care** you need only ask for it. A full set of the bulletins thus far published will be sent without charge, in a convenient loose-leaf binder which will make a valuable addition to your lawn files.

Scott's Seed is known the country over for its dependable quality. It has produced fine turf on more than 1500 golf courses and is the preference of scores of colleges, universities and high schools for the athletic field and campus.



Choose Scott's Seed and save yourself weed worries.

SCOTT'S LAWN SEED

For Parks, Lawns, Golf Courses and Airports.

Scott's Lawn Seed made its début years ago as a practically weedless, chaffless mixture. Every grass put into it represented the highest standard of quality. The original formula, varied only in recent years to include Bent, comprises only those grasses that make for a good, permanent lawn. The demand for such seed first came from discriminating home owners, then from landscape architects and other users of pure seed, and the mixture is now being sown in every grass-growing state and province in the United States and Canada. If our reputation as seedsmen is of any consequence today, it is because years ago we conceived the ambition to sell purer seed than anyone else.

SCOTT'S SHADY MIXTURE

Scott's Shady Mixture is a combination that has given phenomenal success where other shady mixtures have failed completely.

BOOKLETS

"The Putting Green"
"Lawn Care" (House Organ)
"Bent Lawns"
"Airports"
"Scott's Field Seed Guide"
"Scott's Turf Builder"

STANDARD OIL OF NEW YORK

DIVISION OF SOCONY-VACUUM OIL COMPANY, INCORPORATED

26 Broadway, New York, N. Y.

THE DE VEAUX SCHOOL FOR BOYS, NIAGARA FALLS, N. Y.
Road Construction with Socony Asphalt Products

Socony Asphalt Binders "B" and "C"

Socony Cold Patch Asphalt

STANDARD BRAND SOCONY ASPHALTS AND ROAD OILS

Socony Liquid Asphalt

Socony Asphalt Paving Fillers

Asphalt Macadam Roads

Asphalt Macadam Roads built by the Penetration Method are recognized by leading engineers as one of the most durable types of construction, being economical in cost and maintenance. This type presents a non-skid, all-weather surface, ideal for school and university grounds.

Socony Asphalt Binders "B" and "C" are widely used for such construction, in amounts varying from 2 to 3 gallons per square yard, being applied at temperatures ranging from 275 degrees to 350 degrees.

For Surface Treating of Gravel Roads and Paths

For economical treatment of dirt and gravel roads and paths, where it is desired to lay the dust and protect the surface with an Asphaltic mat, Socony Liquid Asphalts are produced in different grades to meet particular requirements. Socony Liquid Asphalts are usually applied in amounts varying from ¼ to ½-gallon per square yard and require a cover of sharp sand or clean gravel.

For Repairing Road and Path Surfaces

Socony Cold Patch Asphalt is an ideal patching material for repairing holes, ruts and depressions in all types of bituminous road surfaces. It is equally effective for restoring worn, uneven surfaces of brick and wood block pavements.

For each cubic yard of ½-inch to ¾-inch dry stone, we recommend the use of about 16 gallons of Socony Cold Patch Asphalt. Socony Cold Patch Asphalt is used without heating and is workable the year round.

For Filling Joints of Brick and Concrete Pavements

Socony Asphalt Paving Fillers (Standard Brand) for filling joints of brick, granite, and concrete pavements are especially refined Asphalts of high melting point. We also supply Asphalt Fillers containing mineral matter. Either of these grades is poured or squeezed to produce a rigid pavement.

THE STEWART IRON WORKS CO.

"The World's Greatest Fence Builders Since 1886"

130 Stewart Block, Cincinnati, Ohio

PRODUCTS

IRON PICKET FENCES
CHAIN LINK WIRE FENCES
IRON AND CHAIN LINK GATES
BASEBALL BACKSTOPS
TENNIS COURT BACKSTOPS

Stewart FENCES

PRODUCTS

METAL FOLDING CHAIRS
WINDOW GUARDS
WIRE MESH PARTITIONS
FOLDING GATES
FLAGPOLES, ETC.

STEWART SCHOOL FENCES

We offer a complete line of Iron and Chain Link Fences and are capable of fulfilling any school fence requirement, whether it be for frontage, rear line, tennis court, or athletic field.

SALES AND ERECTION SERVICE

Stewart factory distributors in all principal cities, together with our competent erection crews throughout the country, give our customers a service both convenient and economical. Each installation is under our supervision — consequently the responsibility is undivided.

FACTORY FACILITIES

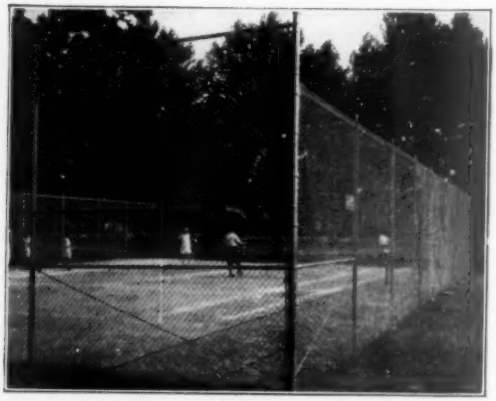
Stewart has unsurpassed facilities for the manufacture of fencing or any of the products listed above. Factory contains 350,000 sq. ft. of floor space, modern machinery; skilled workmen and draftsmen.

LITERATURE AND PRICES UPON REQUEST

Complete catalogs and descriptive data for any Stewart Products as illustrated or listed on this page will be sent upon request. Indicate requirements and when possible, send sketch or diagram giving measurements involved.

STEWART CHAIN LINK FENCE STYLE "OTM." AVAILABLE IN 4'-5'-6' HEIGHTS

Also furnished in Heavy Weight Specifications as "OTH" or with barbed wire overhang feature as "3TH." Write for details.



STEWART TENNIS COURT ENCLOSURE AVAILABLE IN 8'-10' AND 12' HEIGHTS

FOR SCHOOL FRONTAGES, NOTHING SERVES SO WELL AS A DISTINCTIVE IRON FENCE. STEWART HAS OVER 300 STANDARD DESIGNS FROM WHICH TO CHOOSE

TORO MANUFACTURING CO.

America's Largest Builders of Power Grass-Cutting Machinery

3042–3206 Snelling Ave., Minneapolis, Minn.

TRACTORS — POWER LAWN MOWERS — ROLLERS

Write for Complete Catalog

THE TORO PARK SPECIAL

Amazingly efficient small power mower . . . flexible, easy handling, large capacity, low operating and upkeep costs, long life. Makes 30-inch cut, mows 4 to 6 acres a day. Climbs grades without damage to turf. Clean cutting. Powered with the Toro 2 H. P., 4-cycle, air-cooled motor.

TORO PARKWAY SICKLE BAR MOWER

Built especially for cutting weeds, hay or brush up to ¾-inch diameter. Powered with the famous Toro 2 H. P., 4-cycle motor. Heavy duty construction. Easy operation. Positive traction on rough ground and up steep grades assured by large diameter pneumatic-tired wheels.

TORO IMPROVED POWER ROLLER

Eliminates tedious hand rolling for tennis courts and athletic fields. Rolling width 30 inches. Weighs (with operator) about 1250 lbs. Speed up to 3½ M.P.H. Forward and reverse gear obviates constant turning, giving 84-inch rolling width. Toro standard 4-cycle, air-cooled motor . . . 3 H. P.

WORTHINGTON MOWER COMPANY

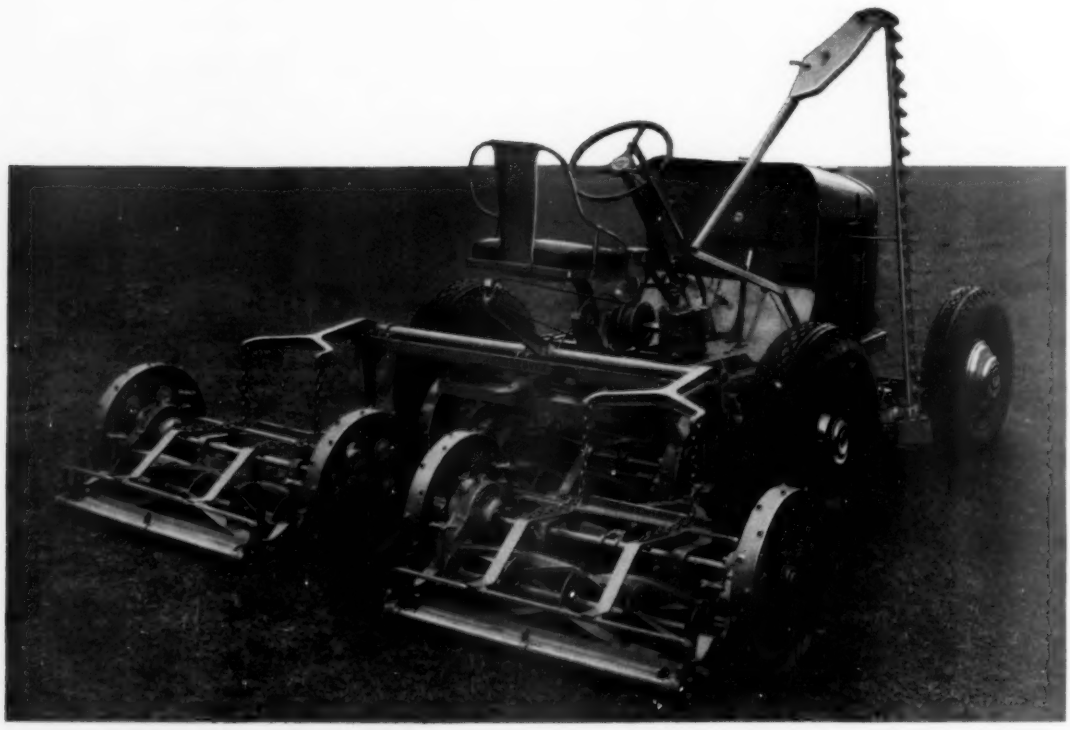
Main Office and Factory

Stroudsburg, Pa.

SALES AGENCIES IN ALL PRINCIPAL CITIES

Machinery of Specialized Design to Meet Every Mowing Requirement

FOR SCHOOLS AND HOSPITALS
FOR MUNICIPAL PARK SYSTEMS AND GOLF COURSES



THIS ONE MOWING OUTFIT DOES THE WORK OF TWO CUTS DOWN CUTTING COSTS

The Worthington Parkover Mower cuts both low and tall grass. The gang of three trailer mowers cuts a swath of lawn 7½ feet wide. The sickle bar attachment cuts the roughs and tall grass. The one Parkover does the work of two separate mowing outfits.

When the trailer mowers are in use, the sickle bar cutter is folded up on side of tractor. When the sickle bar is in use, the three trailer mowers are lifted up. Sickle bar is easily detachable.

The big airway tires pad softly over the grass or roadway. Neither packing them down nor marking them. Curbs 10 inches high can be run over without harm to either machine or curb.

Mowers cut at rate of 10 miles an hour, or can run from one location to another at 15 miles. Consume so little as ½ gallon of gas an hour. It's the only machine made combining the two kinds of mowers. Send for special circular giving full information and prices.

Section V

BUILDINGS AND EQUIPMENT FOR PHYSICAL EDUCATION AND PLAY

The Development of Outdoor Areas for Physical Education

BY GEORGE E. LITTLE
DIRECTOR OF PHYSICAL EDUCATION, RUTGERS UNIVERSITY
and
CLIFTON V. BARRETT
ENGINEER, RUTGERS UNIVERSITY, OUTDOOR ATHLETIC DEVELOPMENT

I

BY GEORGE E. LITTLE

IT is most gratifying to observe the vast amount of recreational areas being provided by Federal funds throughout our country today. This movement has made it possible for communities, schools, colleges and universities to so expand their recreational facilities that the youth of the United States will find greater opportunity in the near future to enjoy healthful participation in both recreative and competitive sports.

The CWA and ERA made important contributions during 1934, and WPA and PWA projects comprise an American movement that characterizes the year 1935 as one of outstanding progress.

This is certainly the appropriate time for the existence of a close relationship between the technical planner, the architect or engineer, and the responsible persons whose duty it is to conduct the various types of programs. The term "athletic engineering" may well express the function of building and maintaining areas for major programs of play and recreation.

The logical procedure would be to enlist the cooperation of each type of expert in treating a subject of this kind. The sports promoter needs the technical expert, and the technical expert needs the sports promoter, for the desired result. For the past one and one-half years, we have been fortunate at Rutgers University to have the aid of a group of architects, engineers and draftsmen available to us through the courtesy of the various Federal projects. They have made a detailed study of physical education plants of many American educational institutions. From this study we have been better able to plan a comprehensive outdoor physical education plant, complete in its details, for the purpose of supplying our present undergraduate body, and that estimated for the future, with adequate space for athletic participation.

Included in the above group was Clifton V. Barrett, an engineer with broad technical experience combined with a background as a participant in and loyal supporter of athletics, who has been recently appointed Superintendent of the new Rutgers outdoor athletic project.

Many trips were made by Mr. Barrett and myself to recreational areas and athletic plants of every description in the Middle Atlantic area previous to our cooperation in the preparation of this article. We invite any one interested to visit this project in the course of construction or after its completion. The preparation of this outdoor plant during the current year, in a vast center of population, may well serve as a practical laboratory to people living within a reasonable radius of New Brunswick.

Prior to the period of depression there existed in this country, for a period of about ten years, what might be called a "stadia era." Large sums of money were expended for huge amphitheaters, while comparatively little attention was given to the physical recreation of the large number of undergraduates of schools, colleges and universities.

Experience gained by the sponsors of this stadia-building campaign has resulted in the consolidation of all outdoor facilities, including stadia sites and practice and exhibition areas for the benefit of all undergraduates, instead of merely for followers of football. In taking the position that college football is only a part of the entire physical education program, we in no way wish to minimize its importance and the valuable part played by it in the whole scheme of undergraduate life.

Our plan, as contemplated by the Rutgers Administration and the Department of Physical Education, has been to select an area of land as

near as possible to the Rutgers Campus, to take care of any expansion of program with the growth of the University. We are concerned first with the construction of ample playing areas, well drained and surfaced, to accommodate seasonal outdoor sports for the entire group who will like to participate. The manner in which this space might best be allocated to the various sports is later explained under the head of "Usage." (See page 209.)

II—THE IDEAL PLAN

By CLIFTON V. BARRETT

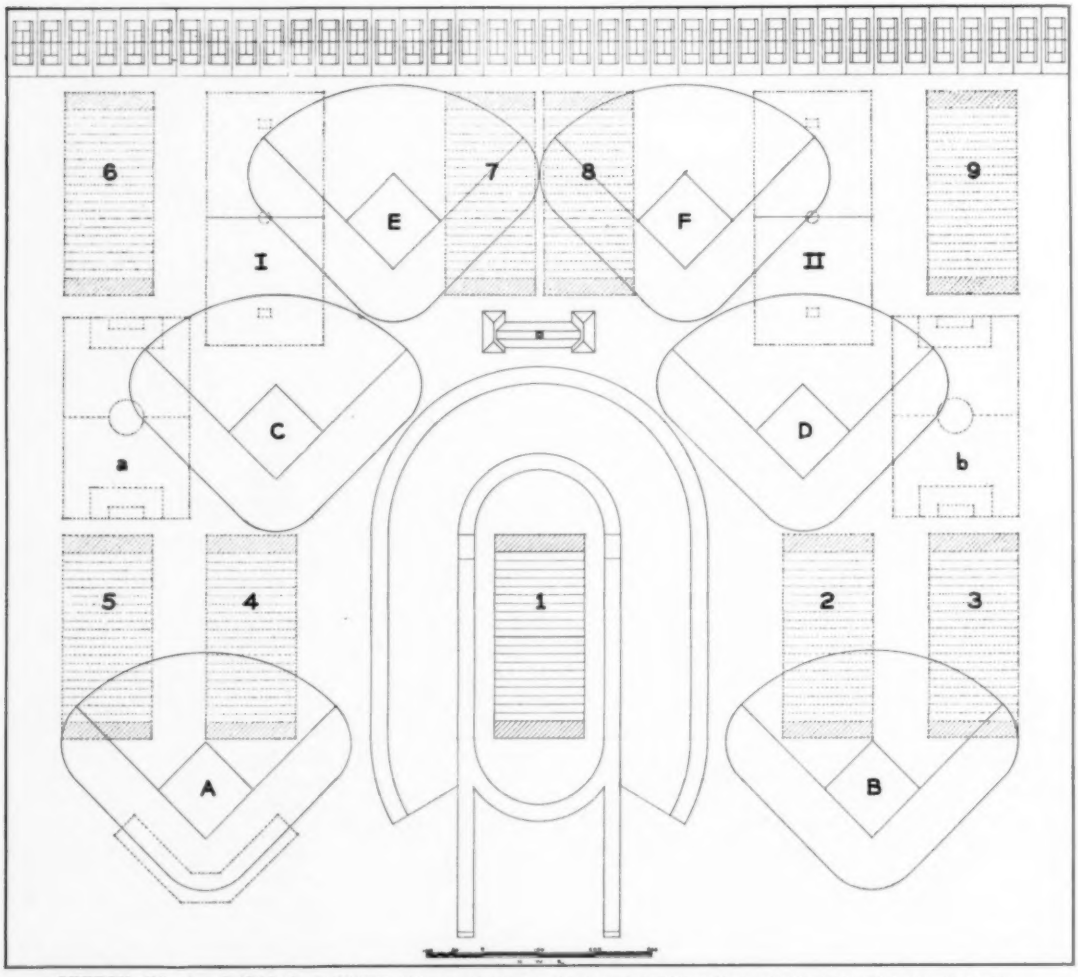
CONFRONTED by the problem of planning an adequate area for outdoor athletic facilities, the normal mind seeks first the advice of experience; inquires into the elements of successful achievement and strives to avoid the pitfalls of inept experiments.

The ideal is an exhibitional area commensurate with the spectator demand, surrounded by generous and numerous participation fields where all who will may find opportunity to attain physical health.

School and college fields average fifty years of usage. The decision on locations should be influenced by a number of important factors:

Speculative purchase; because the fourth or fifth generation hence may need new or greater areas. The increased value of the old will provide the source of funds to purchase the new holdings. Keen judgment should be exercised that the holdings may fall into the classification of quick assets.

Beauty of surroundings; because the athletic



SKETCH NO. 1.—TYPICAL LAYOUT ON A 60-ACRE TRACT, FURNISHING ATHLETIC FACILITIES FOR A STUDENT BODY OF 5,000

SKETCH NO. 2.—HOW THE TYPICAL PLAN WAS ADAPTED TO THE TERRAIN AND THE REQUIREMENTS AT RUTGERS UNIVERSITY

area should be a place to which the participant will return again and again with joy and zest. The play fields should be a segment of "the great outdoors," in a natural setting, where it is pleasant to be.

Accessibility; because the arterial approaches may be burdened by the heavy traffic of large crowds assembling in the exhibitional areas, and because the students' need of exercise should be filled by their use of the fields and not by their labors in arriving thereon.

Scan closely the status of donated real estate. Beware of the Grecian gift. A land donation may ultimately prove to be the free park nucleus of a real estate development. Analyze the possibilities of the surrounding tracts, the possibilities of adverse ownership. The view which today reaches to far horizons may tomorrow be restricted by the rising walls of a new glue factory. The rights and possible demands of abutting property owners should be well investigated.

Above all, the factor of *adaptability* demands all the foresight and practical advice that can be made available.

Extensive earth movements, expensive rock cuts, major soil treatments, form a trio of budget destroyers that will exhaust the most robust financial reserve. A topographical and soil survey should be a compulsory insurance against unseen costs. The advice of engineers and soil specialists may well save many times the cost of their services.

An adequate supply of potable water is imperative; a generous supply for irrigation is highly desirable. Assurance of economical drainage and sewage disposal should precede purchase.

No matter how many acres are purchased, the total will be barely sufficient or less.

A stadium or other exhibition area adequate for lacrosse, soccer and intercollegiate football, surrounded by a 400-meter track and having one or two 200-meter straightaways, requires 9 acres.

A baseball field with the outfield dual-purposed for any or all of the contact sports, requires 5 acres.

A double diamond accommodating four grid-irons consumes 9 acres.

Parking areas that may be quickly filled and emptied require 5 acres per thousand cars.

Sketch No. 1 shows a typical layout on a 60-acre tract, sufficient to fill the needs of a student body of 5,000. Although not shown, a full five-mile course for the cross-country runners can be laid out circumscribing the tract and ending on the stadium straightaway. This layout may be increased or decreased as usage demands.

The plan contemplates a stadium and a possible exhibition baseball diamond in the foreground adjacent to main road approaches. The practice and intramural participation fields are

planned to center on a field house located back of the stadium. A tunnel approach to the stadium field from the field house is a desirable detail. The generous spacing of field center lines permits a comprehensive landscaping scheme, minor roads to the more distant fields and other details of usage.

The plan is not advanced as a workable scheme, but as a working basis. In putting the plan into practice, many changes and compromises will be forced upon the builder. Inequalities of elevation, rock ledges, wooded areas and location of road approaches will compel many changes before an efficient workable layout can be evolved.

Sketch No. 2 shows how this plan was adapted to the terrain and to the requirements at Rutgers.

The exhibition baseball field has been shifted radically, and the layout of practice fields altered to conform to the sloping character of the land. The fields are terraced one above the other, so that the maximum cut and fill shall not exceed 4 feet.

The orientation of all fields should be north and south, and since most of the school-field usage occurs after 3 o'clock in the afternoon, it is not well to plan fields otherwise. However, most builders can take their azimuth or leave it, and will make some slight compromise to obviate questionable grading expense. The proper alignment is most important in baseball, where neither the batter nor the catcher should face the sun. Where the pitcher throws north to the receiver, they, in common with batter and first baseman, do not have to "take" the sun.

A workable plan having been formulated, a few simple rules and admonishments will govern its execution.

Unless an unlimited supply of top-soil is cheaply available, the supply at hand must be carefully husbanded and stored for replacement. Average top-soil containing fair proportions of organic matter may well have been a hundred years in the making. If it is lost, its restoration or replacement will be extremely costly.

The top-soil having been stored, the sub-soil may be graded to a rough plane and rolled or otherwise settled. It is not good practice to make extensive cuts or fills. Primarily, deep cuts are bound to be expensive. Secondarily, the maintenance of field levels over deep fills will prove more expensive. Settling and compaction of fill is, at best, a difficult quantity to compute. This difficulty increases as the fourth power of the depth. A balancing cut and fill of 4 feet seems a fair limit for economical grading. There are unlimited instances of greater transfers, but for each one the bill of expense was not in proportion to the results obtained.

A fairly rough level being established, an inviolable rule must be invoked. Drain well! All the future utility and economy of the maintenance of the fields rests upon obedience to this rule. Conventional practice is to install 6-inch tile drains on 50-foot centers. This is a rule observed as often in the breach as by conformance.

The Yale Bowl, most famous American stadium, has no drainage system; the water-table lies 14 feet below the surface of the field and excess moisture quickly sinks through a 14-foot gravel sub-soil. On the other hand, the Yankee Stadium has two systems of drainage pipes. One is of 11 9-inch pipe lines laid down in the outfield, and the other of 24 6-inch lines in the infield, pitching from the box toward the baselines. It is so well drained that an ordinary rainfall ceasing an hour before starting time will not prevent a game.

Local conditions as studied by a competent engineer can alone dictate the requirements of drainage.

A suitable pipe system having been laid, a field sub-base of porous texture should be applied. This ordinarily will be 12 to 14 inches of coarse cinders compacted by moderate rolling to a 10-inch stratum. The term cinders as here employed does not include ashes. Well-weathered hard coal cinders which have passed over a ½-inch screen are not objectionable, but ordinary stove ashes will in due time choke any drainage system. There are a number of substitutes of varying value. Any substance that will not disintegrate, that will remain porous and provide resiliency for a "springy" field, can be used.

The top-soil may now be replaced and graded correctly, and, after any necessary correction of soil deficiencies, sowed to a green manure crop of soy beans or Sudan grass in summer, substituting rye and vetch as a winter crop, followed by a seeding to grass.

The subject of turf building and maintenance is too broad to be encompassed in this article. Dr. Howard B. Sprague, one of the foremost authorities on soil and turf structure, wrote a clear and comprehensive treatise on the subject for the 1933-34 edition of THE AMERICAN SCHOOL AND UNIVERSITY. Dr. Sprague is the Agronomist in Charge, at the New Jersey State Agricultural Experiment Station in New Brunswick. Needless to say, the soil preparation and turf building at Rutgers will be carried out under his advice and guidance.

Probably the simplest way to discuss exhibition field layout would be to state what is planned for the future Rutgers Stadium and to explain the reasons for so planning.

Since the favorite game of today may change in popularity through the years, the field dimensions are such that intercollegiate football, soccer, rugby and lacrosse may be played on regulation fields within the track curb. By excluding baseball from this area, it will be possible to build and economically maintain a far better turf structure.

The jumping and vaulting pits will be confined to the segments between goal lines and track curves. One good reason for this decision is that the hazard of a lacrosse or football contestant stepping into an unguarded sawdust pit will be

eliminated. The runways will be "double enders," each having posts and bar for the pole vault at one end and the broad-jump pit at the other. These will be adjacent to the goal lines. The area of the segment nearest the track curve will be utilized for the high jump, its shape permitting the desirable semi-circular runway. Circles for the discus throw are contemplated within this area, as well as a run for the javelin throw.

The track originally planned was 100 meters on each of the curves and 100 meters on the tangents. This seemed a good, safe rule-of-thumb for track layout providing "soft" curves that would not impede the runners, while providing adequately long tangents. The dimensions of the lacrosse field necessitated slightly longer tangents and compensating shorter curves. The curves are still better than most, being on 110-foot radii.

The 200-meter straightaway will be on the east side of the field, permitting the 400 to be run with one turn. The dash will be 33 feet between curbs, and the curves and back-stretch 25 feet wide. Such track widths are all too rare in the East, although conventional in the Middle and Far West.

A quotation from Lawson Robertson's recent article in the *Saturday Evening Post* on Japanese stadia is enlightening. It reads: "The tracks in these stadia are from 40 to 60 feet wide and are beautifully and scientifically banked."

Track meets have all too many times become tedious because preliminary heats, quarter-finals and semi-finals have tired the spectators almost as greatly as they did the contestants.

The probable utilization of this particular track for interscholastic as well as intercollegiate contests was a factor determining the track dimensions.

Mr. Robertson's comment recalls a letter emanating from the office of the President of the Intercollegiate Association of Amateur Athletes of America and addressed to all members. While the subject matter of the letter pertained more particularly to indoor tracks, its application to outdoor tracks is equally clear. It would appear that what is compulsory in board track design is at least highly desirable on cinder paths.

By permission, we quote the following paragraphs from this letter:

"We are faced with a condition, not a theory. Few have given thought to the design of a track from an engineering standpoint. Will you not consult with some competent member of the staff of your engineering school who can discuss intelligently the problem of centrifugal force and the proper banking of a curve. It has been felt that a large part of the objection to the present track is from mental reaction. If the track is scientifically right, it should be used. If it is not scientifically right, it should be changed.

"It is obvious that no track can be perfect for the reason that runners must use the track at different speeds. The best that can be done is a happy medium."

The elemental theory is that the runner should be at all times perpendicular to the track. To provide for this, it is planned to bank the track curves at a pitch computed on the speed of the top-flight runners of the 400-meter distance.

No claim of originality or revolutionary thought is here advanced. It is realized that, in many cases, the introduction of baseball in the stadia has prohibited any banking of the tracks. Research has disclosed several reasons of expediency that opposed this method, but too great a number fell back on the reflection that good old Siwash had a flat track and what was good enough for Siwash ought to suffice any in the world.

As an interlude, the history of one phase of the Rutgers planning is here introduced.

In the study of the 256-acre tract purchased by the University, an abandoned half-mile trotting track was discovered. Search disclosed that this track was well built. The base was of heavy rubble. The sub-surface was porous. There was adequate tile drainage. The only lack was a judicious application of cinders and clay to provide a marvelous half-mile running track, banked curves and everything.

But, alas, the woodpile inhabitant was discovered in the fact that the infield was expensively seeded and sodded and was the fairway of the sixth hole on the golf course. The hint that golf might be played elsewhere fell on deaf ears and no utilization of this opportunity has been accomplished—yet.

The point to be made by this recital is that there are, awaiting the keen eyes of playfield investigators, many similar abandoned tracks not so zealously guarded by militant greens committees.

III—USAGE

By George E. Little

THE diagram including various sports areas presented as an ideal has much to recommend it. Its construction, plan, method of drainage, surfacing and complete outline have been heretofore explained. An effort will now be made to indicate the way in which these various areas would serve a school, college, university and community. Operating a seasonal sports schedule plan for fall and spring, upon dual-purpose areas, we will proceed to utilize every available bit of space in a manner most advantageous to both participants and responsible leaders.

FALL SEASON—ACTIVITY SCHEDULE

Area	Sport	Time	Nature of Activity	Average Number Participating Per Week
Gridiron No. 1	Varsity football	2:00–4:30 P.M. Saturday	Exhibition area only	
Gridiron No. 2 (Practice)	Varsity football	4:00–6:00 P.M.	Kicking and passing, combination backs, ends and centers. Line drill. Individual and group scrimmage	60
Gridiron No. 3 (Practice)	Freshman football	4:00–5:30 P.M.	Same as above	75
Gridiron No. 4	150-pound Varsity football. (lightweight to include Freshmen)	4:00–6:00 P.M.	Same as above Practice games and scrimmage	100
Gridiron No. 5	Intramural touch and Varsity football	3:30–6:00 P.M.	Daily schedule of games for intramural, both touch and Varsity football	100
Gridiron No. 6	Intramural	3:30–6:00 P.M.	Intramural practice, games, physical education course	100
Gridiron No. 7	Intramural	3:30–6:00 P.M.	Intramural practice and games	100
Gridiron No. 8	Intramural	3:30–6:00 P.M.	Intramural practice and games	100
Gridiron No. 9	Lacrosse		Additional lacrosse practice. Weight event practice	50
Soccer areas a & b	Soccer football	3:30–6:00 P.M.	Daily practice, scrimmage and games	100
Lacrosse Areas I & II	Lacrosse	3:30–6:00 P.M.	Daily practice, scrimmage and games	100
Exhibition track and field area	Track and field events	3:30–5:30 P.M.	Sprinting, middle and long distance running, hurdling, jumping, vaulting, weight events	165
			Total	1,050

The average undergraduate group will avail themselves of practically every available outdoor sport after the opening of college in the fall. These activities consist of football, touch football, soccer football, cross-country running, track and field sports, lacrosse, baseball, golf, tennis and rowing. Some will choose swimming, basketball, and wrestling, preferring to participate in the pool and gymnasium even during the outdoor season because they are better fitted for those particular sports.

It has been our experience during the past four years at Rutgers that every available square foot of sodded area placed at the disposal of the undergraduates is utilized. These outdoor sports, with the exception of rowing, which is conducted on the Raritan River, afford the participants a fine opportunity for fresh air and sunshine, most beneficial to all sound bodily growth. Several factors govern the fall program:

1. Season to extend from about September 1 to December 1.

2. Request from educational authorities to start program practically as soon after 3:30 P.M. as possible, assuming that if such a program could operate so early in the day, it would permit students to return to their respective boarding houses in convenient time for dinner.

3. Daily practice periods for varsity, freshman and light-weight squads. For intramural and other recreative groups, three or four times per week would be sufficient.

Assignment of playing areas to be made as follows:

We will assume that our winter program is held mainly in the Gymnasium during the inclement months of December, January, February and the early part of March. The spring program, in a normal climate, can start in the month of March, with variations in accordance with climatic conditions. In our particular climate, March 15, on well-drained areas for such sports as lacrosse, baseball, track and field and spring football, might well be practical. Grassy areas are at a premium at all times, and we feel that we have advocated throughout this article their production.

In the early spring season there is a great difference between the equally drained cinders for a sprinter and the baseball diamond for the infielder. Therefore, the participation schedule must necessarily be elastic to meet such underfoot conditions.

It has been our experience during recent years that "twilight" baseball for both varsity and intramural games can be practically endorsed.

We will plan our spring schedule of March, April and May upon the assumption that we can take full advantage of a longer period of time for these activities, as a result of daylight saving and longer days.

The spring schedule follows:

THE SPRING PROGRAM

Area	Sport	Time	Nature of Activity	Average Number Participating Per Week
Diamond A	Varsity baseball	3:00–7:00 P.M.	Official Varsity and Freshman Schedule. Daily Varsity practice and games	35
Diamond B	Freshman baseball	3:00–7:00 P.M.	Daily Freshman practice. Practice games	75
Diamond C	Intramural baseball	3:00–8:00 P.M. Twilight games practical, permitting two games to be played	Intramural games. Daily practice. Additional outside games. Each group reporting for practice and games three times per week	100
Diamond D	Intramural baseball	3:00–8:00 P.M. Twilight games practical, permitting two games to be played	Intramural games. Daily practice. Additional outside games. Each group reporting for practice and games three times per week	100
Diamond E	Intramural baseball	3:00–8:00 P.M. Twilight games practical, permitting two games to be played	Intramural games. Daily practice. Additional outside games. Each group reporting for practice and games three times per week	100
Diamond F	Intramural baseball	3:00–8:00 P.M. Twilight games practical, permitting two games to be played	Intramural games. Daily practice. Additional outside games. Each group reporting for practice and games three times per week	100
Miscellaneous areas	Soft-ball, Additional field events. Rugby football	3:00–7:00 P.M.		100
Stadium field. Cinder track 33′. Width 220 yds. Straightaway-quarter-mile oval	Track events 1—Dashes 2—Hurdles 3—Middle and long distance runs	Entire afternoon ——— Laboratory for physical education majors	All scheduled Varsity and Freshman, and intramural meets. Interscholastic and special meets. Daily practice	80
Stadium field. Dual purpose	Field events 1—Pole vault 2—High jump 3—Broad jump 4—Shot-put 5—Discus * 6—Javelin *	Entire afternoon	All scheduled Varsity and Freshman, and intramural meets. Interscholastic and special meets. Daily practice	60
Stadium field. Lacrosse Varsity field	Varsity and Freshman lacrosse		Exhibition area only. Grass to be protected	
Lacrosse field	Lacrosse	3:00–7:00 P.M.	Daily Varsity practice	75
Lacrosse field	Lacrosse	3:00–7:00 P.M.	Freshman practice. Intramural games	100
Tennis (general participation, and Varsity & Freshman, etc.)	Tennis	Entire day	Courts assigned to student body by equalization system	200

* Exhibition only

NOTE: In our ideal situation, it is evident to the reader that encroachments are so made by Diamonds E and F as to interfere with the present location of two lacrosse areas when baseball games are in progress. In each respective corner to these overlapped lacrosse diagrams appear two vacant gridirons, 6 and 9. These areas could be so enlarged, because of their grassy surface, to be excellent lacrosse fields in which the Varsity, Freshman daily practices may be held, as well as intramural games.

Laboratory Control of a Modern Swimming Pool

BY MELVILLE C. WHIPPLE

ASSISTANT PROFESSOR OF SANITARY CHEMISTRY, HARVARD GRADUATE SCHOOL OF ENGINEERING

THE popularity of swimming as a sport and as a recreation has increased to the point where there are now hundreds of outdoor and indoor pools designed to serve this purpose. Some of these are old, and poorly equipped with facilities to discharge the functions of good pools. The majority, however,—and this applies particularly to those recently built,—have as appurtenances modern apparatus which meets the need of providing attractive water and of maintaining that water in a condition that will offer the least hazard to the physical well-being of bathers.

Such equipment of itself will not automatically give the desired results when once set to work. It must have careful supervision by persons who understand the purpose of the different units and their manipulation. Above all, this equipment must prove its worth when subjected to the tests of laboratory control.

Purposes of Laboratory Control

The two principal reasons why the laboratory phase of swimming-pool operation is of importance are as follows: Laboratory tests check the performance of water-treatment processes used. They show the extent to which water quality is influenced by treatment, and indicate the way in which one process must be balanced or counteracted in effect by another. When the addition of chemicals is involved, tests provide a check upon the amount added. A second reason is that laboratory tests measure the adequacy of treatment for the operator and give to the bather an assurance that the quality of the water is known and is probably under proper control. This assurance as to quality is of special importance from the hygienic standpoint. Swimming pools are by their nature a menace to health unless they are adequately safeguarded. Laboratory control of water quality is one of the very important barriers of defense against infection from pools.

Harvard Experience

It is the purpose of this paper to give a description of the tests employed in the control of the swimming pools at the Indoor Athletic Building of Harvard University. These pools were put in operation in March, 1930, and during the subsequent time have been under the control of the Laboratory of Sanitary Engineering so far as quality phases of operation have been concerned.

In the five years of use the water in the pools has been kept highly attractive in a physical way, being free of all traces of suspended matter and presenting the beautiful blue color of well water. The water supply is that of the city of Cambridge, which is surface water purified by rapid sand filters. Likewise, the bacterial content has been very low and the intestinal bacterium, *Escherichia coli*, which is used as an index of pollution, has not been found present in 10 cubic centimeters of water during the five years the pool has been in use. The most important test, that of experience, has provided a record that is free from epidemics of any of those infections known to be capable of transmission through the medium of swimming pools.

The results outlined above have been attained with a fairly simple system of laboratory control and in the author's opinion justify the belief that an elaborate system of control is not called for

POOLS OF THE HARVARD ATHLETIC ASSOCIATION, CAMBRIDGE, MASS.

if proper emphasis is put upon good operation of the purification facilities.

The Harvard Plant

There are two pools in the Indoor Athletic Building and they are placed end to end with a broad walk between them. The smaller is for instruction purposes, is 4 to 5 feet in depth and contains 27,000 gallons of water. The principal pool is 7½ to 10½ feet deep and holds 192,000 gallons. Water from the pools is removed from the bottom and conveyed by gravity to one of two centrifugal pumps, which forces it through the purification apparatus and back to the pools. The apparatus consists in series of a hair and lint catcher, three pressure filters working in parallel and having a combined area of 150 square feet, and a swimming pool type chlorinator. Equipment is installed ahead of the filters for the addition of alum and of soda-ash. After chlorination, the water returns to the two pools through multiple inlets at the surface of each. By manipulation of the proper valves, circulation may be maintained through the pools at a rate that will displace the contents in eight to twelve hours.

Two large foot-baths, consisting of rooms with flooded floors, are placed between the shower-baths and pool room. They reduce the pollution brought into the pool by reason of forcing bathers to wade through the foot-bath before coming to the pool. Such, in brief, is the equipment provided for maintenance of proper water quality.

Points at Which Samples Are Taken

The schedule of sampling has called for collection of samples for laboratory analysis each week on a day following the use of the pools by an evening class of women bathers. This corresponds to the period of heaviest bathing load. There are four places of sampling at which cocks were installed for ease of collection. One is the pipe bringing water from the large pool to the circulating pump. The second is the pipe conveying water from the small pool to the pump. These two samples represent water from the pools before purification. The third place of sampling is the pipe delivering water from the filters after filtration. The fourth is the pipe delivering disinfected water to the two pools after chlorination. These four samples measure the efficiency of the filtration and disinfection processes and reflect the quality of water supplied to the pools and the quality after use.

More frequent sampling than once a week has not demonstrated irregularities in operation nor provided further information of assistance in dictating the method of treatment. It should be stated, however, that daily samples are taken by the attendant to check the amount of chlorine at the inlet and outlet of each pool.

Tests Made upon Samples

The tests for chlorine are designed to show the amount of residual chlorine left in the pools after disinfection of the incoming water. This amount is kept between 0.2- and 0.5-part of chlorine per million parts of water, that is, 0.2- to 0.5-milligram per liter.

The chlorine test is made with an outfit designed for the purpose and known as the La Motte-Enslow chlorine comparator. It consists of a perforated block containing standard color tubes that represent the amount of color produced by known amounts of chlorine when a solution of orthotolidine is added to them. A sample of pool water is placed in an empty tube of the same size as the standard tubes, orthotolidine solution is added to it, and after ten minutes the color produced is compared with the standard tubes by looking through them. When a match is obtained, the amount of chlorine is read off directly. The test is made easily and does not require for its conduct a technically trained person.

In addition to this daily test for chlorine, certain tests are made in the Laboratory of Sanitary Engineering. These are carried out on the weekly samples collected at the sampling points already described. The schedule for laboratory tests is as follows:

Bacteria developing at 37°C.; made on all 4 samples
Presence of coli-aerogenes group; made on all 4 samples
Alkalinity of pool water; made on outlet sample from large pool
pH value, or hydrogen ion concentration; made on outlet sample from large pool

These laboratory tests will be briefly described. For full details of their conduct, the reader is referred to "Standard Methods of Water and Sewage Analysis," published by the American Public Health Association, 50 West 50th St., New York.

Test for Bacteria at 37° Centigrade.—This test gives the number of bacteria at different points in the system which will develop at body temperature on a standard culture medium. In the Harvard pools it represents very largely bacteria which have come from the bodies of bathers and which have not been destroyed by chlorine used as a disinfecting agent. The number is small, varying between 0 and 25 bacteria per cubic centimeter of water.

The test is conducted by placing in a sterile culture dish one cubic centimeter of sample and flowing over this 10 cc of melted standard nutrient agar culture medium. After the medium hardens, the dishes are placed in a bacteriological incubator having a controlled temperature of 37° C. They are kept there for 24 hours. Then the number of bacterial colonies are counted with a magnifying glass. Each colony is assumed to originate from a single bacterial cell. Therefore, the number of colonies represents the number of bacteria present in the original sample which will develop under the given conditions.

Test for Presence of Coli-Aerogenes Group.—This group of bacteria is commonly used as an index of pollution for water. Some members of the group have their habitat in the intestines of warm-blooded animals, including man, others are found in the soil and in other places. If such bacteria are found in water, they may be accompanied by the bacteria of such intestinal diseases as typhoid fever, dysentery and diarrhoea. They are, therefore, an index of potential infection. Because the members of this group that occur in swimming pools originate largely in the intestinal tract of bathers, and because easy methods of developing other forms which pollute pools have not been developed, the coli-aerogenes group is still generally used to measure potential infection of pool waters.

The presence of this group is tested for by planting different measured volumes of the sample in tubes containing sterile lactose broth medium and then incubating the tubes at 37° C. for 48 hours. If gas forms in the tubes within that time, due to bacteria fermenting the lactose sugar, it is taken as presumptive evidence of the presence of the group in that volume of water used for the test. To further confirm the group, culture tubes showing gas are streaked out on dishes containing eosin-methylene blue agar culture medium. If colonies develop which are typical of the coli-aerogenes group, the test is called positive. The number of tests which may be positive under good practice and the allowable number of bacteria developing at 37° C. are given in a report entitled "Swimming Pools and Other Bathing Places" by the Joint Committee on Bathing Places of the American Public Health Association and the Conference of State Sanitary Engineers. (See the *American Journal of Public Health*, December, 1926.)

Test for Alkalinity.—In using alum for the clarification of pool water, it is necessary to have the water sufficiently alkaline to precipitate the alum. Repeated use of alum, and also the constant use of chlorine for disinfection, reduce the natural alkalinity of the water in time to zero. Before this point is reached, it becomes necessary to add sodium carbonate (soda-ash) to restore the alkalinity. In order to have a check on conditions, the test for alkalinity must be made.

This is carried out by measuring 100 cubic centimeters of sample and transferring to a 250-cc glass-stoppered bottle. To this is added 1 cc of erythrosine indicator, which registers by its color the alkalinity or acidity of the sample, and 5 cc of chloroform. There is then added from a burette in small amounts at a time standard fiftieth normal sulphuric acid, which neutralizes and measures the alkalinity present. Acid is added with shaking to the point where the pink color of the erythrosine just becomes discharged. Knowing the amount of acid used, calculation can be made of the amount of alkalinity originally present. This is expressed in parts of calcium carbonate per million parts of water.

pH Value or Hydrogen Ion Concentration.—The true alkalinity of the water is measured by the hydrogen ion concentration, and this is expressed as the pH value. A value of pH 7.0 represents neutrality, a lower value denotes acidity, and a higher value denotes alkalinity. There is some evidence to the effect that waters acid on the pH scale cause irritation of the delicate mucous surfaces of the eyes and nose. Therefore, it is considered good practice to maintain the pH value of swimming-pool waters on the alkaline side, not lower than pH 7.2 to 7.4. This is accomplished, if the alkalinity is depleted by use of alum or chlorine, through the addition of soda-ash. The test for pH value is necessary to tell when soda-ash must be added.

This test is carried out by adding to 10 cc of water 0.5-cc of a solution of a sensitive dye, brom thymol blue. This changes color with the hydrogen ion concentration of the sample within the limits pH 6.0 to 7.6. For pH values outside these limits different dyes, or indicators, must be used. The color of the mixture is compared in a perforated block comparator with similar tubes containing brom-thymol blue in solutions of different pH value. These standard tubes may be purchased from chemical supply houses in sealed form. When a color match is obtained between a standard tube and the sample tube, the pH value of the sample is read from the pH value of the standard tube.

With the aid of such tests as have been described, the quality of the water in the Harvard pools has been closely controlled. With the additional help coming from careful operation on the part of attendants, there have resulted a minimum of complaints and an absence of communicable diseases traceable to use of the pools.

Cork-Surfaced Tennis Courts at Colgate University

BY WILLIAM A. REID
GRADUATE MANAGER OF ATHLETICS

STUDENT interest and participation in any particular sport are dependent to a large degree upon the excellence of the facilities available. During the college year 1934-5 at Colgate, we proved that this is true of tennis.

Prior to the fall term of the year, our tennis players were dependent upon clay courts. The central New York climate is quite severe, with long, hard winters. The clay courts were available for play some time between May 1 and 15. In the fall there was little, if any, play possible after October 15. With college opening about September 20 and closing about June 10, and a day's drying time necessary after rains before the courts were playable, our effective tennis season did not exceed forty playing days. The clay courts were expensive and troublesome to maintain, and were generally uncertain and unsatisfactory. There was no great use of them by the students, and at the end of the 1934 spring term interest in tennis at Colgate was at a very low ebb.

During the summer of 1934, we installed the first unit of an entirely new tennis plant. This consisted of five doubles and three singles courts, designed to be as nearly playable under any weather conditions as outdoor tennis courts in this climate can be. Gavin Hadden, civil engineer, of New York City, who has designed and built many stadiums and athletic fields, wrote the specifications for the courts and supervised their construction, and made use of a newly perfected "Corkturf" surface in building the courts.

To Mr. Hadden and myself, the use of this surface was largely experimental. There is a great deal of pre-mixed pavement at Colgate, and it has been extremely satisfactory on campus driveways and walks. We had no doubt that the same mixture and application would work well as a hard-surfaced tennis court, but were frankly skeptical of the claim that the use of granulated cork instead of finely crushed stone would make a tennis court surface equal to grass in playing qualities, but free from the maintenance expense and responsibility which we had experienced with clay courts.

Construction of the New Courts

The new courts were constructed where there had formerly been a battery of clay courts, built on a foundation consisting of a mixture of cinders, gravel and crushed stone. In building the new courts, the old clay surface was first removed. Then the foundation, about 4 inches thick, was scraped off and stocked temporarily in piles at either end of the site. The subsoil was then graded to a slope of 4 inches fall to 120 feet horizontal distance, and an open drainage ditch was dug along the lower side. After the subgrade had been thoroughly rolled, the piles of founda-

tion material were brought back, spread uniformly and rolled. This subsurface was very carefully graded to the slope described above, and again rolled.

Upon this foundation the contractor laid a regular pre-mixed sheet asphalt pavement of the correct dimensions for the five doubles and three singles courts laid out side by side in a row. Two double courts at one end of the row were then surfaced with cork. One of the cork-surfaced courts was painted a dark grass-green with white lines, as recommended by the contractor, while the other was left unpainted except for the white lines. The remainder of the hard asphalt-surfaced area was made into three doubles and three singles courts by marking on the lines with white paint.

So much for the methods of construction followed. It was Mr. Hadden's thought, and I agreed, that the experimental aspects of the whole job were limited to the cork surfaces. If these proved a failure, the cork could be scraped off, and there would still be a good hard surface left underneath.

Conclusions from Experience

Now, as to our experience with these tennis courts, both hard-surfaced and cork-surfaced.

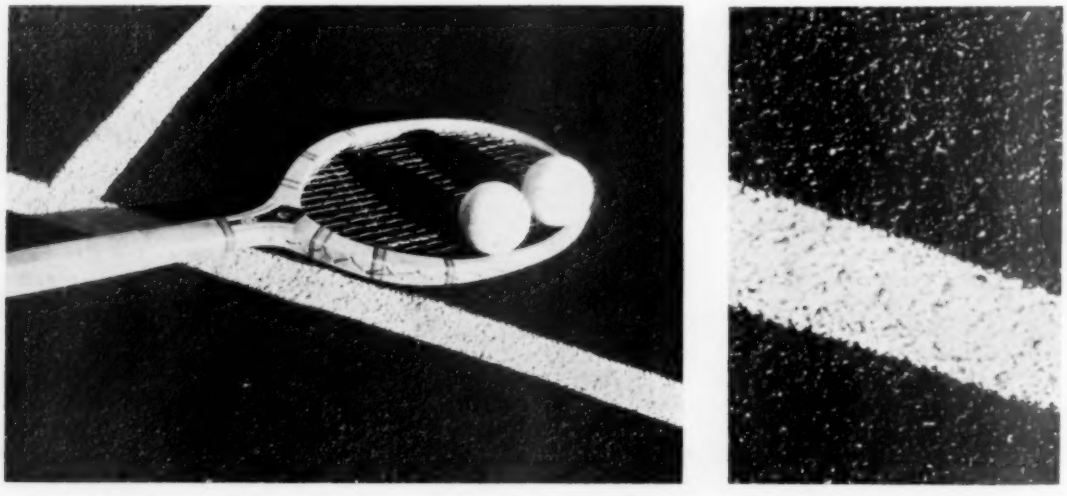
The hard-surfaced courts have served very well as such. They are playable very soon after rain; have required absolutely no attention since their completion except to sweep off the dead leaves last spring, and are smooth and accurate. There has never been any disagreeable softening of the surface under sun heat, nor gathering of asphalt in puddles on the surface. As against these good features, the surfaces of the courts are harsh and hard; cause excessive wear upon tennis balls and tennis shoes and are hard upon the feet. The action of the ball as to height, twist and speed of bounce is of course quite different from that on good clay or grass courts.

So far as any of us here can see, the cork-surfaced courts have the same desirable qualities as to quick drying and freedom from maintenance expense possessed by the hard courts, but are free from the disadvantages characteristic of the latter. The surfaces are soft and resilient; imparting action to the ball similar to that of well-maintained grass and clay courts. On the painted surface, balls last longer than ordinarily and do not discolor. Balls do discolor to some extent on the unpainted surface, but less so as time goes on.

We are holding this court unpainted for experimental purposes, and for our own information, in spite of the fact that the contractor wishes to paint it and recommends painting in all instances. The only cracks which have shown are paint cracks in the surface and are not serious. The courts have had severe use and there has been a scuffing-off of paint in small spots, but not enough to seriously affect the appearance of the court. Some slight retouching of paint will probably be desirable next year. The courts are playable at practically all times except when rain is actually falling.

The courts were constantly used well into November, and spring play was started April 1. It is safe to say that during the college year the effective tennis season, measured by the number of hours when the courts were playable, was more than twice as long as in any previous year. The cork surface is very easy on the feet and upon tennis shoes.

Robert C. Hubbard, the tennis coach, is very enthusiastic about the "Corkturf" courts and is anxious to have the surface installed upon all the hard courts just as soon as possible. Mr. Hubbard says that not only has interest in tennis at least doubled since the installation of these courts, but that the average quality of the game played



PORTION OF CORK-SURFACED TENNIS COURT, AND ENLARGEMENT SHOWING TEXTURE

has improved tremendously. Nearly every week-end from April 20 until the University closed, we had a dual tennis meet with some other college or university and, on account of the quick-drying feature of the courts, all matches scheduled were run off. The practical certainty that this can be done adds greatly to the enjoyment and satisfaction to be derived from such pre-arranged inter-collegiate events.

The cork-surfaced courts were in demand at all times during the season, the painted court being first choice in every case. All inter-collegiate matches as well as our own tournaments were played upon the cork courts, and visiting players were enthusiastic about them.

Certainly we have no intention of tearing off the cork surface. On the contrary, we shall install it over more hard courts as fast as practicable. It would seem that this new surface, if it continues to work out here as experience gives every reason to expect, should go far to solve the tennis problems of many colleges and universities. It gives more and better tennis per dollar expended than any other court that we know of, and greater first cost involved in its installation is quickly made up by its freedom from maintenance expense.

In conclusion, I can say with entire conviction that the first step in our plan to increase interest in tennis at Colgate has been successful beyond our expectations, and there is already a demand for additional facilities. There is ample room to duplicate the first unit with a second battery of eight courts alongside the first, and we look forward to making such an installation at an early date.

There is no question as to the growing popularity of tennis at this time, and there is much in its favor as a brand of student athletics. Less space per player is required than for other outdoor games, and the cost per player-hour is comparatively low. It is a keenly competitive game and a source of splendid exercise without the expenditure of too much time. It is our intention to increase tennis facilities at Colgate as fast as circumstances permit.

Play Spaces for Small Children

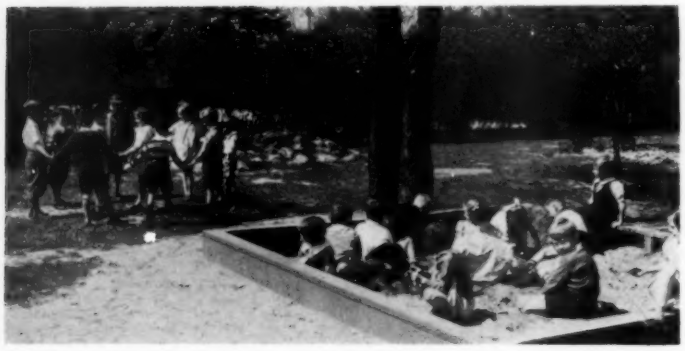
BY HELEN L. JEWITT, M. A.

SUPERVISOR OF ELEMENTARY PHYSICAL EDUCATION, SHAKER HEIGHTS, OHIO

OVER a space of some twenty years we have conceived a new idea of play. Our forefathers had little time to "play," nor did they allow their children time for the activities we now consider so important. Gradually changing conditions have forced upon us this new conception. We have more leisure time. Our studies of child psychology have proved the seriousness of play to the child himself and to the character-building possibilities inherent in play activities. We no longer think of children's play as a waste of time, but rather as a necessary, vital part of the child's life, so necessary that there may be grave doubt as to the outcome of the child in adult life if he has had no opportunity for play.

Vast sums of money have been appropriated in our large cities for the purpose of buying and equipping play spaces in over-crowded and over-populated districts. The kind of play these children indulge in has become important in modern and enlightened cities. Correct use of leisure time has become a by-word—and so we spend money and thought on the kind of play our children shall have in order that the best possible back-

THIS WIDE AREA IS APPROXIMATELY FOUR ACRES, ENOUGH SPACE FOR FOUR BASEBALL DIAMONDS, FOOTBALL AND SOCCER FIELD, WITH SPACE LEFT OVER FOR OTHER TYPES OF ACTIVITIES



A CORNER OF THE SMALL CHILDREN'S PLAY SPACE, WITH TENNIS COURTS IN THE BACKGROUND

ground may be created for the future and the present as well.

New Responsibility of the School

As the conception of play has changed, so also the duties and responsibilities of the school have changed. More time is now spent in school than at home. The school has become a definite factor in the character building of the child. The school and the home are working together rather than as separate units. School is no longer a bugbear, but a place to which children like to go, and so they come before the doors are open and stay late in the afternoon. The school, therefore, has assumed much of the responsibility for the child's leisure time—leisure which used to be spent at home in his own back yard or in the vacant lot or street nearby.

Logically, the playground is planned and maintained by such organizations as church, county, settlement house, recreation centers and schools, all of them safe places where children may gather to play their games. The school, in planning its play space, takes into consideration its average number of pupils and builds accordingly. In a summary of a statement on "Space Requirements for Children's Playgrounds" worked out by the National Recreation Association in consultation with the Recreation Department of the Russell Sage Foundation (see THE AMERICAN SCHOOL AND UNIVERSITY for 1936, pages 192-194), it is suggested that the minimum play space required to serve 300 school children should be 2.55 acres, and that a playground for 1,000 school children should include as much as 5.35 acres in order to care for the play needs of this group.

The Playground Surface

There are many kinds of surfaces to consider in laying out a playground. Ideally, grass is much preferred because there are fewer chances of accident through falling and it is easier to play upon. Economic reasons, however, make this type of playground less possible than one would desire. In northern Ohio, for instance, the impervious clay soil makes the growing of grass difficult, especially in shady areas. The ground is easily worn bare by many feet. In certain months of the year play upon grassy plots makes any later growth of grass impossible.

Cinders and small pebbles are often used for surfaces, but on such playgrounds first aid to

TWO TYPICAL SURFACINGS, GROUND SLAG IN THE FOREGROUND AND TURF IN THE BACKGROUND
Note the tennis courts in the right and center and the different heights of climbing bars

knees and hands and feet will be necessary because of frequent falls. Infections result from lack of care when cinders and dirt are ground into a cut. If possible, the use of cinders and small pebbles to surface a playground should be avoided. On the other hand, ground slag may be used with fewer possibilities of infection and will prove a firm though rough surface. Naturally, no dirt, cinder or slag surface is very pleasant during a dry season, because of dust.

Playground Equipment

Play spaces are usually equipped with swings, teeter-totters, merry-go-rounds, junglegyms, sandboxes, bars to climb upon, etc. In crowded districts where children have no toys or apparatus of their own, there are good reasons for having this equipment. Children are attracted to the planned play space and thereby kept from less desirable haunts. In districts where the play space is large and the children come of families who can supply toys at home, and there are no undesirable spots to be avoided, it would not seem necessary to provide equipment beyond balls, bats, sand-boxes, bars, etc. A play space with several baseball diamonds, soccer fields, tennis courts, jumping pits, etc., seems ample.

Accidents sometimes occur when equipment is crowded. Children should be taught to be considerate and not to crowd others off the apparatus. Only apparatus that is not in itself dangerous for small children to use belongs on a playground.

The Shaker Heights Play Spaces

Shaker Heights is unusually fortunate in having a wide area around each school upon which the children may play. The average enrolment of the eight elementary schools is 275, and the average play space is from three to four acres. The larger schools, enrolling over 300 pupils, have play areas of nine acres or more, and each of the schools of under 200 has approximately two acres available for play. The total enrolment of the elementary schools, the Junior High and High School is 4,000 children. The total acreage is 96 acres.

Wherever it is possible, the play spaces at the Shaker Heights schools are turfed. Some of the play areas are divided into two parts, one surface being turf and the other ground slag. In front of and beside each school there is a considerable expanse of lawn upon which the children are allowed to play from April through the fall months, when the ground is dry and grass cannot be injured. In other words, the lawns and accompanying landscaping are planned for the children and not as pleasant things for neighbors to look at.

Supervision of Play

Play periods are supervised by the regular physical education staff of the Shaker Heights Schools, who carry on play after school as a part of their regular gymnasium class work. Ideally, all free periods of play, including the after-school, recess, and noon periods, should be supervised. This is difficult with a heavy teaching schedule, and particularly so if one teacher must cover from two to three schools per week. The physical education teacher may plan with the children their free periods, carrying on with pupil leaders, but this plan has many pitfalls when actually put into practice. Playgrounds are most successfully run under adult supervision.

The Shaker Summer Playground

For several years Shaker Heights playgrounds have been open to Shaker Heights children for summer play under competent supervisors who are directly responsible to the Board of Education. Such activities as baseball, tennis, nature hikes, swimming, and dramatics, are maintained on a fee basis to pay for equipment and supervisory staff. In rainy weather the adjoining schools are open to the children. The summer schedule begins immediately after the close of school and continues until the middle of August.

Climbing bars are the only apparatus on the Shaker Heights playgrounds. There are planned spaces for sports around each school. Many playgrounds have tennis courts, all of them have baseball diamonds, soccer and football fields. In addition, there are sand-boxes and allotted spaces where the smallest children may play without the chance of accident. All material used in the gymnasiums of the elementary schools, such as balls, bats, jumping standards, mats, nets, etc., is available for use on the playground. Responsible children see that it is returned to its place when the play is over, so that loss of equipment is practically nil.

The Shaker Heights Pool

The Shaker Heights indoor pool is a part of the equipment of the new High School. The Board of Education intends that no child shall graduate from the schools without knowing how to swim. Therefore the swimming classes consist of children from the elementary schools as well as Junior High and High School pupils. Under competent instructors, boys and girls between the ages of six to twelve have special classes three times a week from the beginning of the school year through the summer. They are taught the elementary strokes and are encouraged to proceed as fast as possible toward proficiency in taking care of themselves in the water under any conditions.

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This 1500 to 4000-watt open-type floodlight is available in three mountings

This 300 to 1500-watt light is available in five mountings

G-E Floodlights Have Made Night Sports Popular

In 1923, the first night football game was played by Tufts College and General Electric engineers, with G-E Novalux floodlighting projectors. Today G-E floodlights are lighting athletic fields for colleges, prep schools and high schools all over the United States; and athletic meets, football and baseball games, tennis, hockey and many other games and contests are held at night with great success.

Football

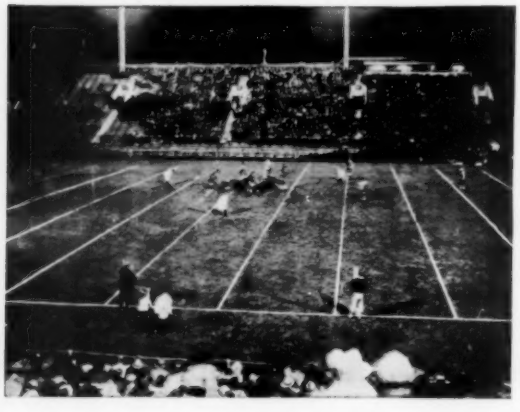
Since 1930, more than 125 football fields have been permanently and adequately lighted by General Electric, with big increases in attendance and gate receipts. Football practice, too, before five o'clock in the afternoon has often been difficult, or impossible, for some students to attend.

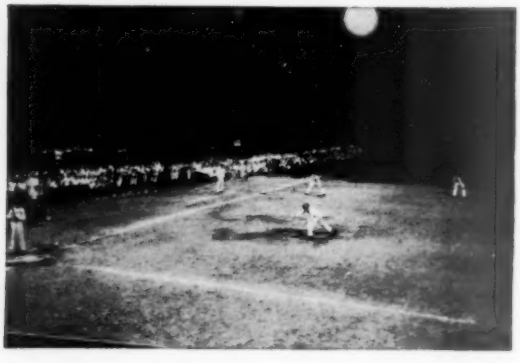
The perfect illumination of the field attainable with G-E floodlights enables the field to be used for many additional hours each day.

For the football field, five poles on each side, four to six 1000-watt projectors on each pole (either open or closed type) are recommended.

Baseball

Additional revenue from gate receipts justifies the expense of installing floodlights for the baseball field. The floodlights should be mounted on poles high enough (70-90 feet) to be out of the usual angle of vision, or on top of nearby buildings or grandstands. Either open or enclosed type may be used.





Open-Type Floodlights are generally used for the lighting of large areas, particularly baseball and football fields. These lights are available in ratings from 300 to 4000 watts, and in five types of mountings. **Write for Booklet GEA-1973.** These lights are easy to install and to clean, and extremely inexpensive.

Side View of Type L-31, Novalux Projector with clear plain lens

Enclosed-Type Floodlights are of course more completely protected from the elements than the open type. They are often used for evening football and other games where additional revenues justify the expense. They are extensively used for swimming pools, night lighting of buildings, monuments, etc. Type AL-29 is small size, used with a 250-watt lamp; Type AL-30 uses a 500-watt lamp; and Type AL-31 uses a 1000-watt lamp. A wide variety of door glasses provide flexibility in beam pattern.

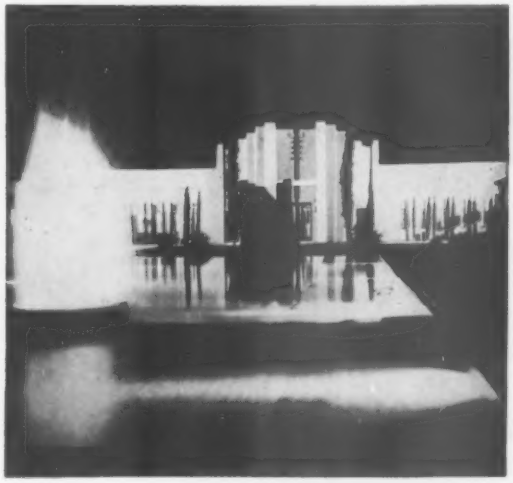
Type L-41—Novalux Projector, Submersible fountain type, for Swimming Pools

Tennis

Open-type floodlights are inexpensive and are generally used for this sport. Eight small floodlights will light one or two courts; ten will light three courts. General Electric engineers have prepared layout drawings for lighting this sport as well as for lighting many others. Floodlighted tennis courts are always popular.

Swimming Pools

Two general systems of lighting swimming pools are being successfully used—overhead lighting, where floodlights illuminate the surface of the water; and underwater lighting, where floodlights are located in the side and end walls of the pool below the surface. The latter method makes every movement of the swimmers clearly visible—an important safety factor.



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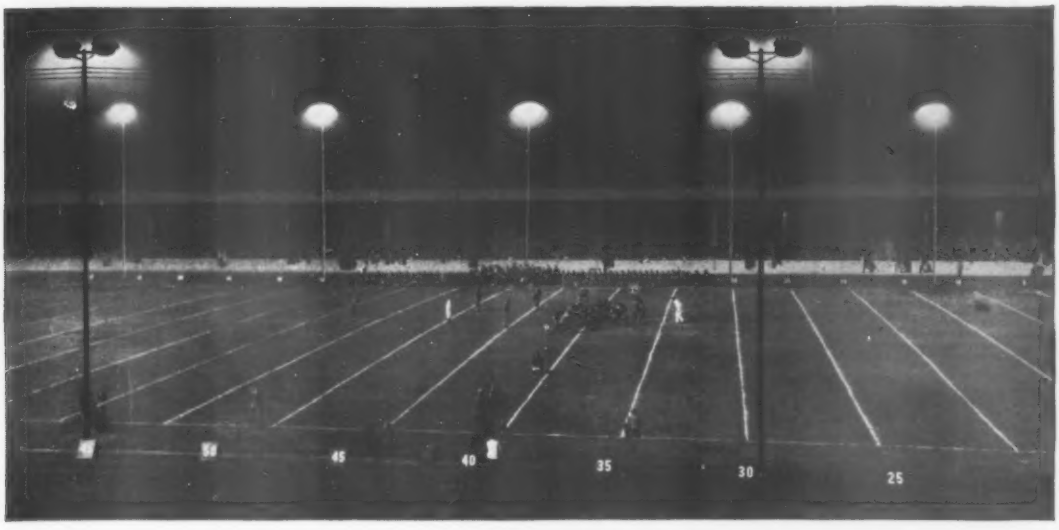

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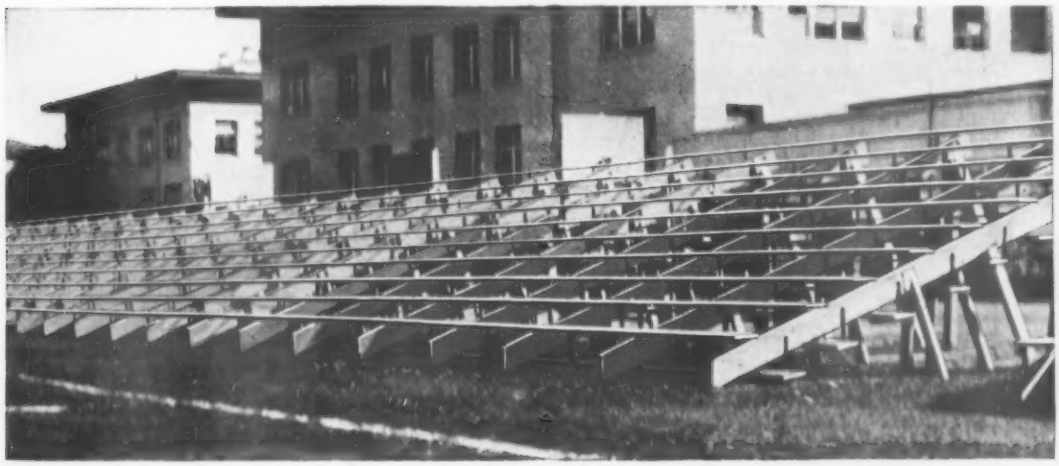

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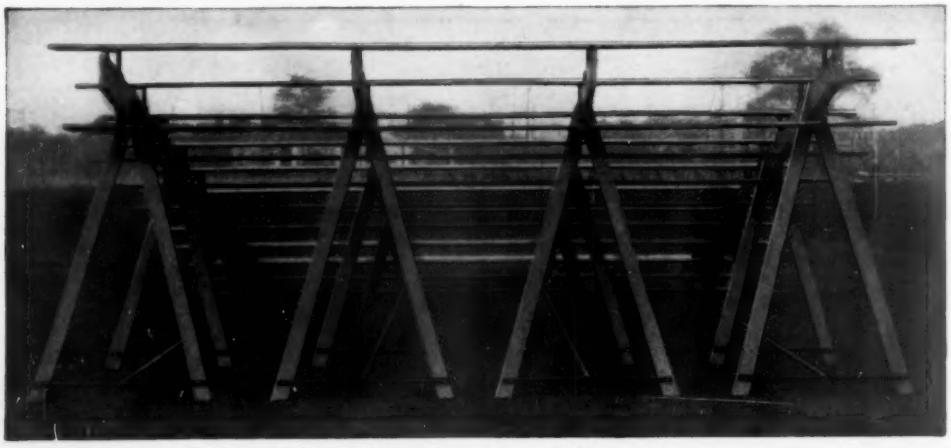
One thing that immediately strikes the eye of the observer is the long line of **even seatboards** in any Atlas bleacher section. (See illustration above.) Boards laid this way give added seating capacity and neat appearance.

Another feature, not so readily seen, is the **Acme corrugated steel bar imbedded deep in the ends of all seat boards and foot boards**—the most perfect method of preventing splitting ever devised.

For complete description, illustrations and specifications, write for booklet, "Atlas Portable Bleachers," 2170 E. Jefferson Ave., Detroit.



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Benjamin "Play-Area" Floodlights

Designed to provide the highest quality of illumination for outdoor sport and recreational areas, the Benjamin "Play-Area" Floodlight combines a large open-type diffusing porcelain enameled steel reflector with an inner auxiliary reflector of oxidized aluminum. Ideal for lighting football fields, baseball fields, race tracks, swimming pools, athletic fields, etc.

Reflectors are 28½ inches long and 17½ inches from front to back; finished green outside, white inside. Metal fittings not aluminum are cadmium plated.

Designed for use with 750-1500 watt lamps and supplied with following mounting brackets: Cross arm type for attaching to wood cross arm; cross arm type with pipe clamp for clamping around 1 to 2-inch pipe; pole cap bracket type for fitting over 1½ or 2-inch pipe.

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Open type floodlights of elliptical shape for floodlighting sport and recreational areas. Combine a porcelain enameled steel reflector with an inner projector of oxidized aluminum. Unique, detachable hood makes possible removal of reflector for cleaning. Two sizes of units: 300-500 watt, with reflector 20" long and 14¾" deep; 750-1500 watt, with reflector, 21⅞" long and 14¾" deep. Supplied with pendant hood tapped ¾ inch, or with any bracket described above under "Play-Area" units.

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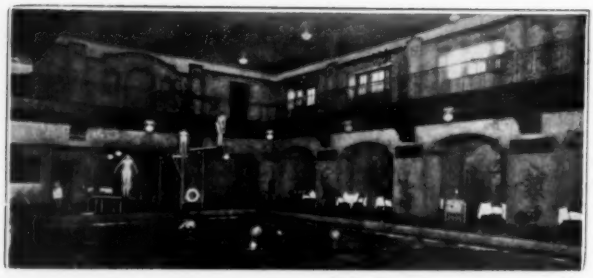

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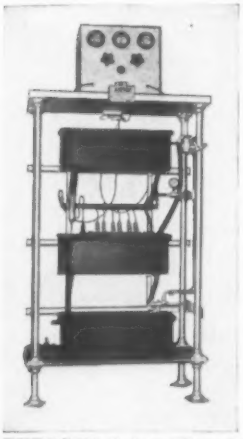
EVERSON *Safety Electric* Chlorinator

Ends hazards attendant to storing dangerous gas in pressure drums. Ends need for special venting chamber. Ends inconvenience and losses through storing chemicals, etc., etc.



EVERSON Safety Electric Chlorinator

Sterilizes Pool Water with Sodium Hypochlorite which it manufactures **as needed** from ordinary rock salt and water. Sodium Hypochlorite is the new and far better sterilizing agent. Its long active life permits it to permeate every part of the pool; it even sterilizes the filters. Still it maintains pool water's pH value, keeps it bland, non-irritating and non-medicated. Operates for a few cents per day. ***Write for special bulletin.***

EVERSON Vacuum Solution *Feed* Gas Chlorinator

Just out. This new Model G Series Chlorinator provides a moderately priced accurate means of feeding and mixing chlorine for sterilizing swimming pools that can be safely operated by any attendant. Gas is fed in accurately measured quantities through a pulsating meter, is intimately mixed with water in a hard rubber, water sealed chamber and is then fed to the pool.

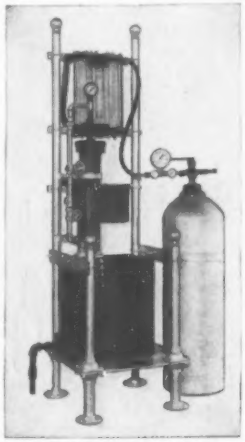
All gas is automatically vented that is not absorbed.

All parts in contact with gas are of rubber, glass or non-corrosion alloy, are safely and easily removable and cleanable.

EVERSON Chemical Feed Chlorinator and EVERSON Tested Chemicals

Especially designed where limited funds or an extremely short season makes low initial cost essential. Mix and feed **dry chemicals** for sterilizing pool water. Lowest price standard "Chlorinators" made. ***Write for bulletin.***

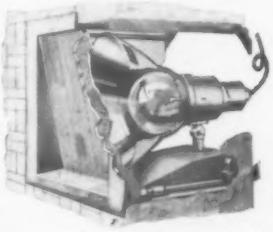
EVERSON tested chemicals are especially prepared and packaged for swimming pool use. Full strength tested chemicals in convenient quantities and form. ***Write for description and price sheet.***



EVERSON Metered Feed Gas Chlorinator

Typical EVERSON School Pool

EVERSON Underwater Lights Add to Safety, Aid Instructions



By making swimmers clearly visible at all times and by permitting close observation of every detail of form and stroke, EVERSON Lights prevent possibility of drowning and greatly facilitate instruction and coaching. By converting the pool water into a glowing mass through which swimmers can be watched at all depths, and by obviating the need for overhead lighting with its fatiguing reflections, these lights "stage" and add greatly to the interest and enjoyment of contests and exhibitions.

Specially designed (not adapted) for pool use EVERSON Lights with their special diffused lenses, special reflectors, frames, etc., attain entirely different results than any other methods of underwater lighting.

EVERSON Suction Pool Cleaners

For removing sediment from pool floors. These better, light tools are strong (special metal), are easier to handle, still do a thorough cleaning job. Recommended for both built-in (part or recirculating system) and portable units.

Portable Pool Cleaners

For outdoor pools, and tanks (without recirculating system). Electric or gasoline powered units that serve also for washing walks, fighting fires, etc.

If It's for the Swimming Pool EVERSON Has It

Spring Boards
Diving Stands
Life Saving Hooks
Buoys
Pool Ladders
Recirculating Fitting
Coco and Rubber Matting
Foot Baths, etc., etc.

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Playground Apparatus, Beach and Pool Equipment

EVERWEAR RECREATION APPARATUS IS WORLD KNOWN FOR SAFETY, DURABILITY, BEAUTY AND PLAYABILITY
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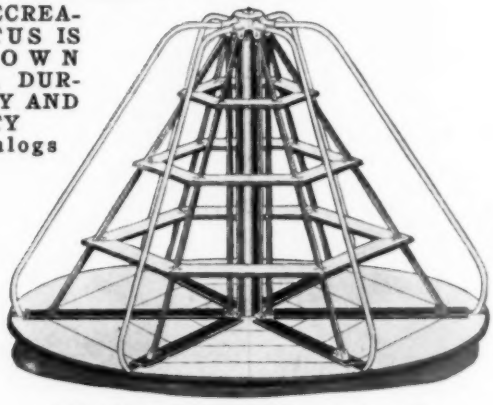
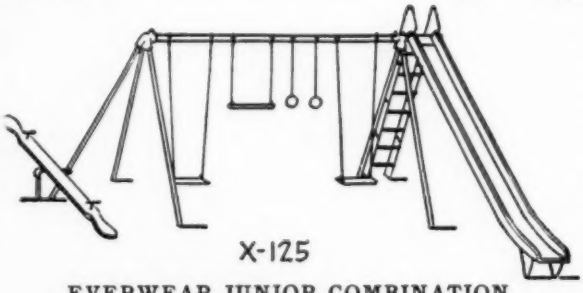
EVERWEAR MERRY-WAVE-STRIDE
(Patented 1740304)

This is the original of this splendid outfit. Accommodates up to 15 children. The name describes its motion and suggests its uses: "Merry" for merry - go - round; "Wave" for ocean wave; "Stride" for giant stride. No. X-225 Merry - Wave-Stride.



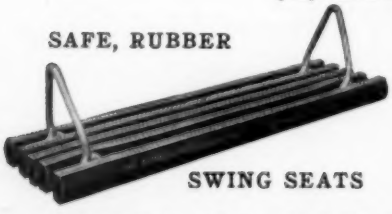
EVERWEAR WHIRLING CLIMB
(Patent applied for)

This exclusive Ever-Wear outfit is unique and attractive for the playground. Accommodates up to thirty children. Has a circular motion, like a merry-go-round, and the children climb all over it: the higher they climb, the closer they are to the center, which constitutes a vital factor to its safety. No. M-555 Whirling Climb.



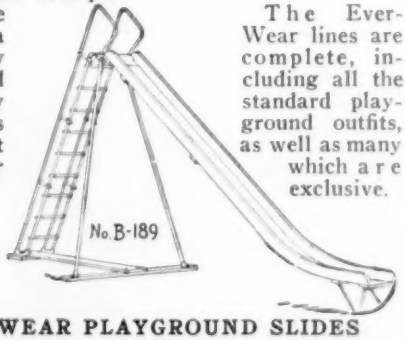
EVERWEAR JUNIOR COMBINATION

This is the most attractive combination of play units ever arranged on one frame. It is particularly adapted for the playground where a wide variety of play functions are desired within a comparatively small area. The outfit is 8 feet high and 20 feet long. No. X-125 Junior Combination Outfit.



EVERWEAR SR-206 SPRING-RUBBER SAFETY SEAT FOR SWINGS
(Covered by U. S. and foreign patents)

This safe swing seat gives an element of safety to the swing which it has never had; changing an outfit classed as very dangerous, into one which can take its fine place on the playground without fear of results. "Reduced our accidents 70 per cent." Investigate them.



The EverWear lines are complete, including all the standard playground outfits, as well as many which are exclusive.

EVERWEAR PLAYGROUND SLIDES

EverWear slides, of all types and sizes, are scientifically designed to be safe; are built strong so they will endure. No. B-189, 16-foot straight slide is illustrated.

EVERWEAR STANDS WEAR AND TEAR

JOHNSON & JOHNSON

New Brunswick, N. J.
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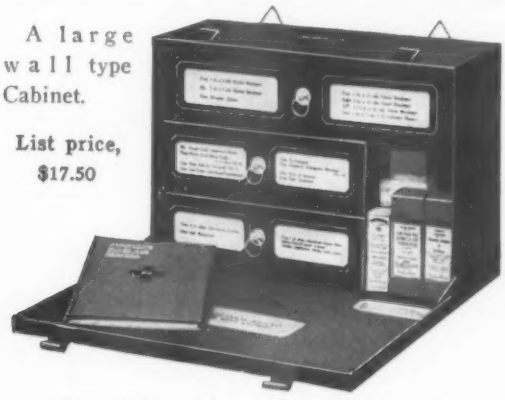
INDUSTRIAL FIRST AID CABINET

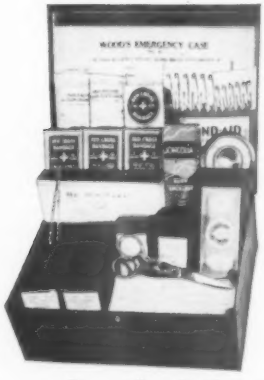
A large wall type Cabinet.

List price, $17.50



Size, 16″ x 12″ x 6¼″. Wgt., 22 lbs.

Wood's Emergency Case



A compact case designed for schools, camps, playgrounds, or laboratories.

List price, $5.25

Size, 9″ x 7½″ x 3″. Wgt., 3½ lbs.

Insurance First Aid Cabinet

Similar to but smaller than the Industrial Cabinet.

List price, $14.00

Size, 15⅞″ x 10½″ x 4⅝″. Wgt., 17 lbs.

ATHLETIC SUPPORTERS
(Coach Line)

Coach No. 50

The best value in a low-priced supporter. Sturdy construction. High-quality elastic.

Coach No. 66

Most for your money in a six-inch waistband supporter. Special elastic with reinforced taped sewing.

Coach No. B6

This supporter is the last word when most rigid support is necessary.

Write for Aid to Athlete Catalog

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H T H (Concentrated hypochlorite)
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Lo-Bax
Liquid Chlorine
Anhydrous Ammonia
Aqua Ammonia—26°
PH-Plus (Fused alkali)
MaFoS (Dishwashing cleanser)

H T H

For a wide variety of sanitary purposes, particularly around the swimming pool, locker room and gymnasium, H T H is a most convenient and reliable source of available chlorine. Concentrated, H T H contains over 70% available chlorine. Moreover, it retains this high strength in warm weather and during long periods of storage.

H T H is a dry, free-flowing powder, readily soluble in water. It is shipped in cases of one dozen 4-lb. cans, each can containing 2½ lbs. of available chlorine.

For Swimming Pools

In use at thousands of swimming pools throughout the country, H T H is used to chlorinate pool water, for general disinfection of surroundings and for prevention of Athlete's Foot. A sanitation routine which provides germicidal and fungicidal protection in and around the pool is easy and economical to follow with this concentrated hypochlorite. (Write us for complete directions.)

For pool water purification, H T H can be added direct to the pool in powder form, or fed in solution form with simple, inexpensive equipment. At many pools where liquid chlorine is used for regular chlorination, a supply of H T H is kept on hand for emergency use in case of a breakdown of pumps or chlorinating equipment, or an interruption in the power supply.

To Prevent Athlete's Foot

Locker rooms, shower rooms, toilets, pool runways, etc., are undoubtedly among the worst offenders in the spread of Athlete's Foot and similar ringworm infections.

Health authorities agree that the best preventive is a careful sanitary routine which includes the use of hypochlorite solutions such as those made from H T H and Lo-Bax, both in footbaths and for general disinfection on surfaces which may transmit infection. In several competent tests, not one new case of infection was reported after this routine was begun. Moreover, many States now require hypochlorite footbaths at public pools.

Sterilizing and Bleaching

School laundries, following the practice of commercial laundries throughout the country, find that H T H solutions are uniform and economical for bleaching and sterilizing linens, towels, uniforms and other white goods, and as a sterilizing rinse for cotton bathing suits. H T H enables them to avoid the danger of over-bleaching, which shortens the life of fabrics, and the alternate danger of inadequate protection.

OTHER MATHIESON PRODUCTS

H T H-15—An all-purpose germicide and deodorant which is ideal for use in school kitchens, dormitories, camps, etc. H T H-15 contains 15% available chlorine and is simply added direct to water by the spoonful to yield economical sodium hypochlorite solutions which are safe to use on metal surfaces, etc.

Lo-Bax—A convenient chlorine carrier packed in 1¾-lb. bottles and containing 50% available chlorine. For preparing fungicidal footbath solutions and for use around shower and locker rooms where limited quantities of hypochlorite are required.

PH-Plus—A fused alkali manufactured especially for restoring to swimming pool water the natural alkalinity it loses in use and during filtration. Makes pool water "feel fine."

MaFoS—A new type of cleanser for dishwashing machines which comes in the form of dense, water-free briquets. Tests prove it more efficient and economical than powdered cleansers.

Swimming Pool at Public School No. 12, Troy, N. Y., Where H T H Is Used to Protect Against Athlete's Foot

METAL OFFICE FURNITURE CO.

Grand Rapids, Michigan

STEELCASE
Business Equipment

Manufacturers of

TERRELL STEEL LOCKERS

Acetylene Welded Frame Corners

Rust-Proof Bolts

No Weld Marks

Adjustable Floor Shoes

Improved Handle Concealed Padlock-Eye

Doors Have Channel Edges

Concealed Hinge Pins

New Locking Mechanism

Tamper-Proof Latching Device

Live Rubber Cushions Silence Door Operation

AND NOW — 4 ADDED ADVANTAGES *AT NO EXTRA COST*

TERRELL LOCKERS, made in a complete range of sizes and styles, meet every requirement of the school or gymnasium. Any grouping of full height or double tier lockers and box lockers can be supplied. Quality and satisfaction are fully guaranteed. **Write for complete information.** **See Page 318 for other products.**

Pre-Locking Device, positive in operation, pick-proof, automatic.

Enclosed Latching Bar, tamper-proof, adding much strength to the door.

New Safety Handle, concealed fastening points, cannot be pried open.

Silenced Operation, with operating parts striking rubber bumpers.

MITCHELL MANUFACTURING CO.

Makers of

"Betterbilt" Playground Apparatus

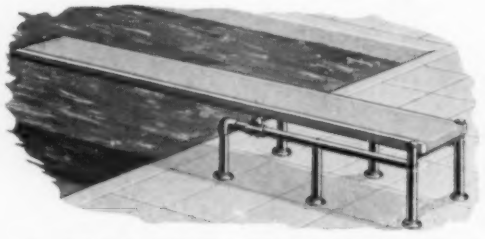
Milwaukee, Wis.

The need of proper recreation facilities in our school and municipal playgrounds grows greater with every passing year. More recreation centers must be prepared for both children and adults, and existing playgrounds must be renovated and re-equipped.

Mitchell Playground Apparatus meets the need for safe, fun-giving, healthful equipment that is also sturdy in construction and economical in price. The Mitchell Manufacturing Company specializes in the production of playground equipment that accommodates the largest number of children at one time, consistent with safety. Mitchell equipment is ideal for playgrounds serving a large number of children of all ages, as it covers every recreational purpose, and is available in an almost endless variety of combinations.

THREE POPULAR NUMBERS

No. 0-1 Mitchell All Steel Slide is the original Slide constructed entirely of steel. The hazard of cracked or slivered bedways and side rails is entirely eliminated by the fact that slide bedways are of galvanized rust-resisting iron, with deep high carbon steel U bar for the side rails. Steps are of malleable iron, and the entire slide is heavily hot-dipped galvanized. Specifications include both straight and wave slides, furnished either stationary or portable; sizes, 12-foot, 16-foot and 20-foot slides.



No. DS-34 One Meter Diving Stand with No. 014 diving board is illustrated. This is only one of numerous beach and swimming pool devices. We also manufacture diving stands of various designs, diving boards, pool ladders, life guard chairs, water slides.

No. 500 Mitchell Whirl gives exercise and pleasure to from one to fifty or more youngsters at one time. It requires only a very small area and may be installed at the lowest cost per child of any known playground apparatus. The platform, while revolving around the heavy center mast, may also be swung to and fro. A minimum of supervision is required, as there are no hazardous features. The Whirl is made in three sizes: No. 500, 16 feet 6 inches in diameter; No. 450, 14 feet; and No. 400, 11 feet.

The FOLD-O-LEG TABLE here illustrated is valuable equipment for schools, cafeterias, parks and recreation centers. It is set up or folded in a moment, easily carried in one hand, unusually strong and rigid when set up, and requiring surprisingly little space when stored. **Write for illustrated circular.**

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Send for a copy of our beautiful 50-page catalog, illustrating and describing the complete "Betterbilt" line.

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Perchloron *means greater safety for* SWIMMING POOLS

Wise pool owners everywhere are using **Perchloron** in their pools . . . also in shallow foot baths placed where the bathers will have to walk through them for preventing the spread of athlete's foot . . . as a bleach and a sterilizer in the rinse water for bath towels and bathing suits . . . and in spray and powder form as an effective deodorizer and disinfectant.

Perchloron contains more than 70% available chlorine . . . Is easy to use . . . Always stable . . . Gives a uniform solution . . . Requires no technical supervision . . . Is conveniently packed (1 dozen cans to the case) . . . No return containers to bother with . . . **and the cost is little. Perchloron** is an American product for American users.

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DESCRIPTIVE LITERATURE

THE AMERICAN SCHOOL AND UNIVERSITY

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Alkalies and Chemical Products Manufactured by
The Solvay Process Company

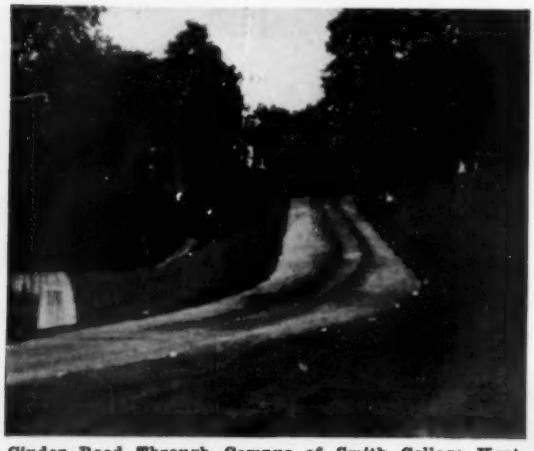
40 RECTOR STREET, NEW YORK

ELIMINATE DUST This *Modern, Easy, Inexpensive Way*

- **On Drives and Walks**
- **Tennis Courts**
- **Playgrounds**
- **Recreation Fields**

Leading schools and universities throughout the country are using Solvay Calcium Chloride to check the problem of annoying, germ-laden dust on gravel and dirt surfaces. Recognized as the "ideal dust layer and surface binder", this clean, white, odorless material produces surfaces that are smooth and clean. It also compacts and consolidates loose surfaces. Does not track or stain—prevents weed growth.

Initial cost surprisingly low—and only one or two applications per season needed. Can be applied by unskilled labor and does not require any expensive equipment. One hundred stockpoints throughout the country insure prompt deliveries — minimum freight rates. Write for prices and booklet.



Cinder Road Through Campus of Smith College Kept Compact and Dustless with Solvay Calcium Chloride

A Few of Harvard University's 92 Tennis Courts That Have Been Treated Regularly for Years with Solvay Calcium Chloride

At Noble School, Detroit, Michigan, the Playing Field Is Absolutely Dust-Free—the Result of Using Solvay Calcium Chloride

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36 Bishop Road, Easton, Penna.

TILITE

For cleaning white tile, terrazzo, marble, porcelain, etc.; also for cleaning brass and bronze.

ERUSTICATOR—Rust stain remover; absolutely safe for all kinds of fabrics and colors.

ERUSTO SOLVENT—For grease, oil, tar and printing ink stains.

ERUSTOLAX—"The Dirt Laxative." Softens dirt in clothes, acting as an aid to soap and detergent in removing dirt. Powerful grease stain remover.

LAUNDRY SOUR—Ferocator Salts, Linen Supply Special, is made especially to meet the requirements of institutional laundries. Write for information.

ERUSTO STRIPPER—Removes fugitive dye stains; also ink, fruit and medicine stains.

ERUSTOHUE—A combination sour and blue, which provides automatic control of the sour-blue operation. If the operator oversours he over-blues.

WRITE FOR SAMPLES AND INFORMATION

HOW TO KEEP YOUR TILE CLEAN

The floors and walls of tiled swimming pools are continually collecting a film of rust and other precipitations from the water supply; the floors and walls of showers and locker rooms, lobbies, corridors, bathrooms, kitchens, sun parlors, cafeterias and all other tiled surfaces become soiled and discolored, not alone from surface dirt and stains but also from forms of dirt embedded into the surface of the tile.

Good detergents will remove surface dirt but not embedded dirt, stains, discolorations, etc.

A good tile cleaner must employ both chemical and abrasive action. An abrasive harsh enough to remove embedded dirt and stains would wear down the tile. The abrasive must be so fine and soft that it will remove surface dirt and ordinary stains but will in no way mar the polish or luster of the tile. The chemical cleansing also must be accomplished safely.

Harmful Acids

Muriatic Acid is sometimes used for cleaning when tile becomes badly stained or discolored. But the fact that it is used to remove surplus cement from newly laid tile proves that muriatic acid is a dangerous cleaner for tile; it will gradually eat away the cement grouting from between the tiles. Tile cleaners containing this acid should be avoided.

Effectiveness and Safety of Tilite

The chemical ingredients of **TILITE** give it maximum cleansing and stain-removing power with absolute safety to the tile and the cement. The abrasive in **TILITE** is so soft and smooth that, in a whiter form, it is used as the base for a tooth-paste. **TILITE** is exceptionally effective for removing iron rust stains, discolorations, waxy dirt, soapy deposits, embedded dirt, oil and grease stains, etc., leaving the tile glisteningly clean and polished.

Free sample and prices will be sent on request.

Some **TILITE Users**—Naval Training Sta., Newport, R. I.; Lafayette College, Easton, Pa.; Lehigh Univ., Bethlehem, Pa.; Dartmouth College, Hanover, N. H.; University of Virginia, Charlottesville, Va.; Gustavus Adolphus College, St. Peter, Minn.; Washburn College, Topeka, Kan.; Detroit Athletic Club, Detroit, Mich.; Numerous Y.M.C.A.'s and Boys' Clubs.

WALLACE & TIERNAN COMPANY, INC.

Manufacturers of Chlorine and Ammonia Control Apparatus

Main Office and Factory: Newark, New Jersey

"SWIM IN DRINKING WATER"

Boston	Chattanooga	Denver	Knoxville	Oklahoma City	Seattle
Bridgeport	Chicago	Detroit	Lexington	Philadelphia	St. Louis
Buffalo	Cleveland	Indianapolis	Los Angeles	Pittsburgh	Syracuse
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Wallace & Tiernan, Ltd., Toronto, Canada
Wallace & Tiernan, Ltd., Winnipeg, Canada
Wallace & Tiernan, Ltd., Montreal, Canada
Wallace & Tiernan, Ltd., London, England

With the school swimming pool firmly established as a part of the physical training program, efficient sterilization is necessarily important. School executives can do no better than to follow advice given in the Report of the Joint Committee of the American Public Health Association and the Conference of State Sanitary Engineers. This report, in part, states: "From all available information, the addition of chlorine either as a gas or water solution by use of proper apparatus is today the most satisfactory method of pool disinfection." Chlorine alone gives the residual penetrating action for the complete protection of bathers at every point in the pool. More than 3000 swimming pools of the United States today rely on W&T chlorinators for positive disinfection.

"SWIM IN DRINKING WATER"

W&T Type MSP Chlorinator—For the majority of medium-sized pools, this type machine is most suitable. It not only accurately controls the small amounts of chlorine but gives a feed range sufficiently wide to include all changes in bathing loads. All control parts are on the outside and a removal hood makes complete inspection possible at any time. Its simple construction and operation are readily understood by the practical pool attendant.

W&T TYPE MSP CHLORINATOR FOR THE STERILIZATION OF AVERAGE SIZED SWIMMING POOLS

W&T Type MSV Chlorinator is the efficient sterilizer for large pools, having heavy bathing loads. Simplified design and sturdy construction have combined to make unusual performance records for this type of chlorinator. Of more than 3000 installed since the first went into service thirteen years ago, not a single machine has ever worn out. A survey of repair costs indicates average annual maintenance charges do not exceed one per cent of the initial investment.

W&T Ammoniator—Used with a W&T chlorinator for the production of chloramine. Chloramine is the most advanced method of pool sterilization. High chlorine residuals can be carried without objectionable tastes or odors. Chloramine rids filters and pool water of algæ growths—a real saving in operating costs. Savings of as much as $200 a season have resulted from the use of chloramine. W&T Ammoniators are made by the same rigid production standards and excellence of material as W&T chlorinators. W&T Ammoniators differ only in the special materials required for the efficient metering of ammonia.

W&T AMMONIATOR USED WITH A W&T CHLORINATOR TO PRODUCE CHLORAMINE

W&T Chlorine Comparator—Swimming pool chlorination can only be controlled accurately, economically and safely when regular use of the orthotolidin test is made. The W&T Hellige Chlorine Comparator meets all requirements for a rugged, portable, accurate testing outfit. Its operation is so simple that accurate determinations of residual chlorine require only a moment's time and no specialized knowledge.

At Your Service—We are prepared to study any problems covering the sterilization of swimming pools and a nation-wide service organization is responsible for satisfactory performance of W&T equipment.

Current literature on the sanitation of swimming pools is available on request.

CLASSROOM—KINDERGARTEN—LIBRARY—COMMERCIAL DEPARTMENT

The Housing of Schools for Young Children in European Countries

BY MARY DABNEY DAVIS

SPECIALIST, NURSERY-KINDERGARTEN-PRIMARY EDUCATION, UNITED STATES OFFICE OF EDUCATION

CERTAIN general standards for buildings in which the schools for young children are housed are recognized in most European countries. One of these standards is exposure to obtain a maximum of sunshine, light, and air. Another is adequate space for the different daily activities—for work and play both indoors and outdoors, for sleeping, for the preparation of food, and for toilets and lavatories. In the maintenance of the buildings there is usually an immaculate orderliness and housekeeping, a meticulous care that requires, in some instances, that visitors use carpet slippers over their shoes.

There is no one plan for housing the schools for these children below school age. Some schools are in especially designed buildings, others are rebuilt residences located near the children's homes, others are in the apartment buildings for workers—either in adapted apartments or in quarters designed especially for them—and others are in public elementary school buildings.

There is a tendency in some countries to look upon the building standards for the younger children as developing suggestions for the elementary public school buildings. For example, the open-air type of building used for the nursery schools in England and in Scotland has been applied to some of the newer elementary school buildings.

Equipment

There is less in common among the countries in the equipment provided than in the school buildings. The majority pay meticulous attention to the children's individual equipment of towels, tooth-brushes, bibs and aprons, and the boxes for their own hand work and drawings, and to the marking of each child's equipment with an identifying symbol or picture. In all countries the equipment for hand washing, bathing and toileting is carefully provided, but the custom in the United States of making sure that such equipment can be controlled by individual children is frequently not the case abroad. The ingenious tanks of water used in many buildings where running water is not available and the washstands in the city schools of some of the countries are fitted with faucets for the children to control. In other cases the water control is fitted for adults only and the lavatories are arranged for the simultaneous use of a group of children, limiting the possibility of training in self-dependence.

The play material in some countries is limited in variety and requires fine muscular coordination. In other countries there is a variety of toys, games, and construction materials that challenge the children's interest and cause no strain when using them. England, Scotland, and the Soviet Union have developed a variety of playground apparatus that is lacking in the outdoor equipment of other countries.

Each country has defined certain goals to achieve in the environment for the children who attend the schools. These goals are included in the summaries of the objectives and standards in the descriptions which follow.

AUSTRIA

One of the kindergarten buildings in Sandleiten, a suburb of Vienna, has been built to provide for 210 needy children living in the municipal apartment dwellings.[1]

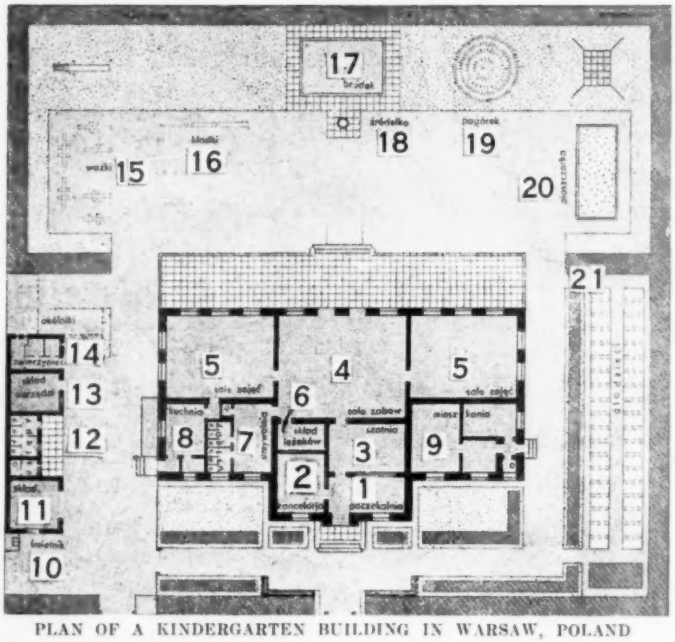
The school program begins at 7 in the morning and continues until 6 in the evening. Consequently, provisions for the preparation and serving of food and for afternoon naps are necessary. To provide a life comparable to family life, children are not customarily segregated into age groups—so adjustments in size of equipment suited for children from 3 to 6 are required for each group. To guard against contagion it is necessary to provide for small groups of children: 22 if there is a group of children less than 3 years

[1] "Die Kindergarten der Stadt Wien," by Philipp Frankowski und Rosa Liederer. Wien I, Deutscher Verlag fur Jugend und Volk. 1932. 32 pp. An English translation of this pamphlet, "The Vienna Municipal Kindergartens," by L. H. Paulovsky, is published from the same office.

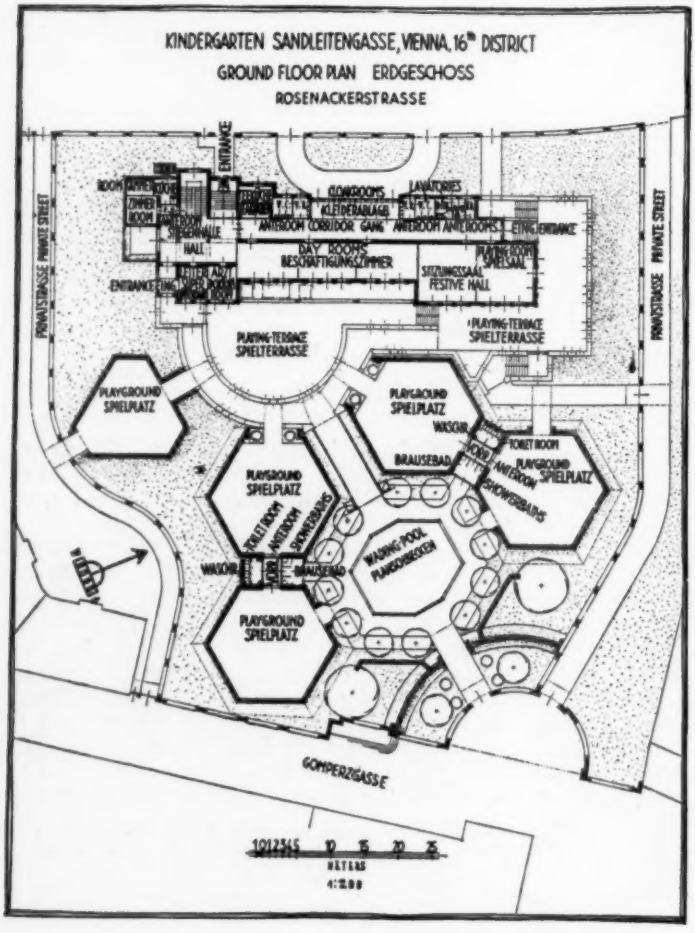
of age; and 30 children from 3 to 6 with an average attendance of possibly 27. To balance the day's activities, there is plenty of outdoor play space in sunshine and fresh air. To these requirements there has been added the need of an atmosphere expressive of joy and happiness. The building was planned to meet the requirements. The entrance hall is decorated with murals showing children at play, and with gay flower designs on the supporting pillars.

The building faces south, and each playroom has its own sun porch. The toilet rooms, doctor's room, staff rooms, kitchen, and dressing rooms are on the north side of the building.

Dressing rooms are partitioned from the halls by wire fencings to allow plenty of air; special hooks and lockers are provided for shoes and clothing. Each child's locker,



PLAN OF A KINDERGARTEN BUILDING IN WARSAW, POLAND



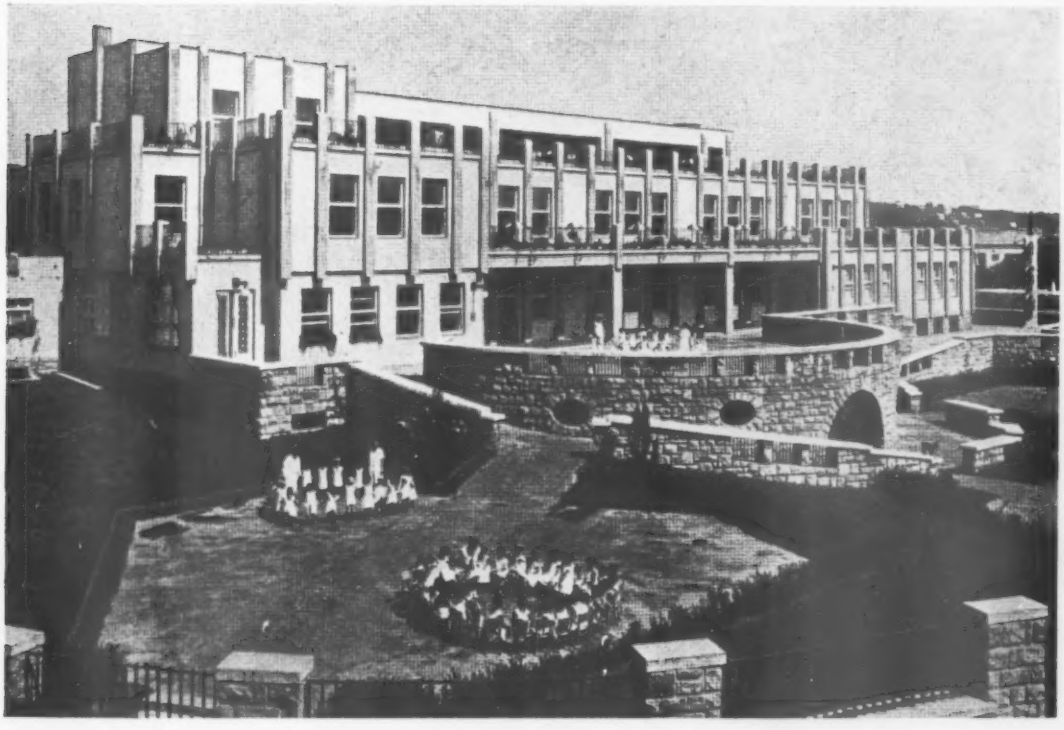
bathroom equipment and bed carry his individual identification mark; his play clothes correspond in color with the scheme of decoration in his playroom and with the colored design on the playroom door. Furniture in the playrooms is enameled and easily washed. Shelves for play equipment are within easy reach of the child. The sleeping cots are woven wicker mats raised about 6 inches from the floor at the head and 3 inches at the foot, and they are easily washed.

Outdoor play spaces designed for the groups of 30 children are fenced off from each other with green hedges. They have hard play surfaces but no stationary or movable play apparatus. Toilets and showerbaths are placed near the playgrounds. In the middle of the group of playgrounds is a wading pool, sloping from 4 to 28 inches in depth. Covered terraces for outdoor play in rainy weather face the garden from the front of the building.

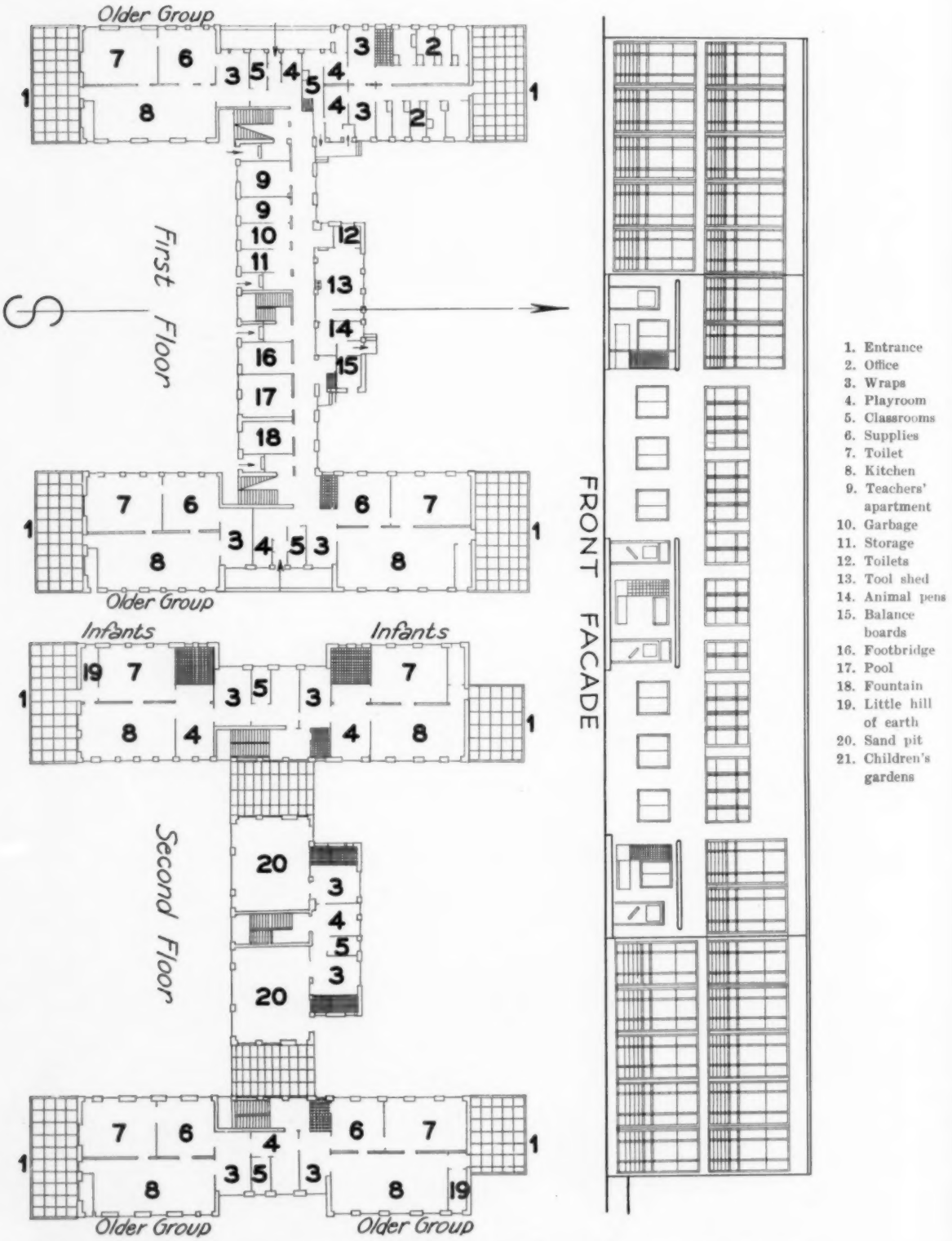
POLAND

The plan reproduced above is for a kindergarten building in Warsaw and is designed to care for a full-day program. It is especially in-

CHILDREN'S WORKSHOP IN THE VIENNA KINDERGARTEN



GENERAL VIEW OF THE KINDERGARTEN IN VIENNA



1. Entrance
2. Office
3. Wraps
4. Playroom
5. Classrooms
6. Supplies
7. Toilet
8. Kitchen
9. Teachers' apartment
10. Garbage
11. Storage
12. Toilets
13. Tool shed
14. Animal pens
15. Balance boards
16. Footbridge
17. Pool
18. Fountain
19. Little hill of earth
20. Sand pit
21. Children's gardens

STANDARDIZED PLAN FOR NURSERIES AND NURSERY SCHOOLS, UNION OF SOCIALIST SOVIET REPUBLICS

teresting because of the preparation for out-of-door activities. Every advantage is taken of the southern exposure for the children's work and playrooms and for the playground.

The room arrangement routes the children from the entrance and the examination office directly through the coatroom to the playroom. Both the kitchen and the teachers' living quarters have separate entrances.

UNION OF SOCIALIST SOVIET REPUBLICS

Since special safeguards are considered necessary for the health of infants and the nursery children, a program of standardized housing has been set up for nurseries and nursery schools by the Commissariat of Health.[3] The essential requirements for the buildings as determined by the Commissariat of Health are based upon the welfare and education needs of the children and upon a necessary and desirable economy. The requirements include the following:

General Plans: In constructing new buildings simplicity and economy are fundamental. At the same time it is necessary to comply with all requirements of essential physical hygiene and child development. The standardization of a barrack type of building is economical in the amount of time required for building and in cost, and will help meet the current demands for nursery buildings at the different industrial and agricultural projects. These buildings may be constructed in units and new ones added as they become needed.

The physical plant must be adequately planned to facilitate the work of the staff and help improve the quality of the work they do. Also, the health of the children must be assured so as to increase the efficiency and the number of working days of the mother.

Facilities must include adequate preparation for a 24-hour day program for the children. This will accommodate parents who are employed on any one of the working shifts of the project with which the nursery is connected.

All new technical achievements are to be utilized in the construction of the buildings so as to permit the best use of such natural factors for the child's health as sun, air, and water.

The capacities of nurseries will be determined by the number of women workers employed. The most advantageous number of children to plan for is from 100 to 150 divided into groups of 15.

Exposure: The children's rooms must face south, southeast, southwest, east or west—according to climatic conditions. Service rooms face north. Light shall be direct, with large window panes. The ratio of window glass to floor space shall be one-fifth to one-sixth in the children's rooms and one-eighth in the service quarters.

Decorations: Light colors are considered best, but should be adapted to the exposure: cool colors for rooms with southern exposure and warm colors for northern exposures. The color effects on the nervous system are "excitement" from red, orange, and yellow, and "composure" from green, blue, and violet.

Room Requirements: For each group of 15 children there shall be a separate entrance, reception and dressing rooms, an inspection room (one room may be used for two groups of children or two rooms for three groups), an isolation room, playroom, sleeping room, bathroom, and porch. The estimated space per child is 4 m_2 in the playroom. Service quarters connected directly with the children's unit include staff room, dining room, office and physician's room, linen rooms, supply room, laundry, kitchen, and toilet. Adjustments in these standards are to be made according to the numbers of children to be enrolled and to new or reconstructed buildings.

Heating: It is necessary to maintain a heat of 65 to 70 degrees Fahrenheit. Stoves or central heating is to be provided.

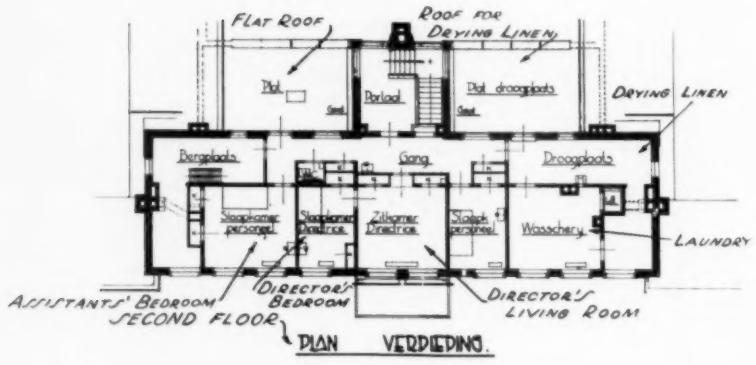
Play Yard: Not less than 50 to 60 square meters of well-drained, sunny space should be provided for each child. Bigger lots are preferred, but can hardly be expected, since city planners are now complaining because of the large amount of available space already allocated to nurseries. Each group should have an individual play space. The playground must have grass plots and hard dirt plots for setting dinner tables, for hand-washing equipment, and for toilet pots; play space for running and marching and apparatus for climbing; an earth mound 4½ feet high, gravel paths, and play facilities with sand and water. Adjustments in equipment are needed according to the ages of the children.

THE NETHERLANDS

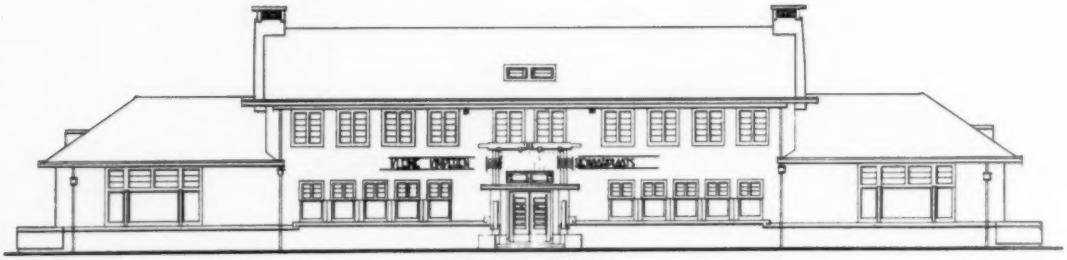
The plans on page 242 are for a day nursery school building completed in 1930. This is the newest of the buildings which house the six nurseries of the Amsterdamsche Vereeniging Tot Instandhouding van Kinderbewaarplaatsen, and is planned to give full day care to 100 children. The building is in a district of municipal housing for low-salaried workmen and receives the children of mothers employed outside the home. An elementary school having three kindergartens is within walking distance.

The building faces west, and the wings of the building allow cross-ventilation and sunshine in all the children's rooms. A play court occupies the space between the wings, and a roof extending over one section of this play court provides for outdoor play in rainy weather. There is no organized playground outside the house. The children's rooms are assigned by ages—infants in

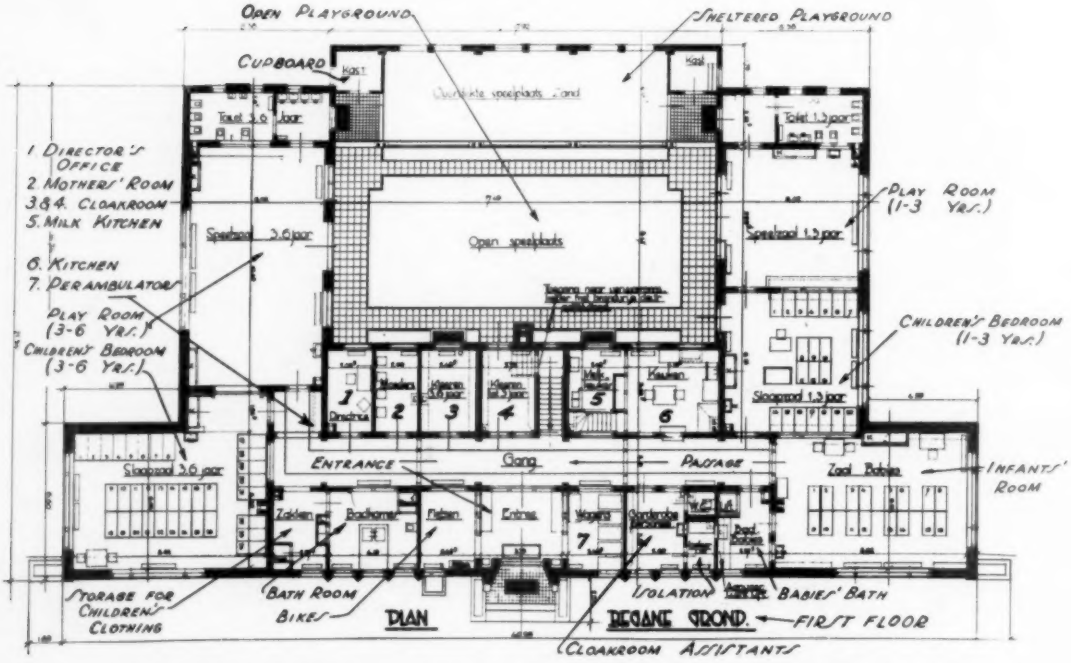
[3] Iasel'noe Stroitel'stvo. Printsipy Planirovki i Elementy Iaslei. I N. S. Nazarova i A. Iu. Dunaevskii. Gosudarstvennoe Meditsinskoe Izdatel'stvo. Moskva—Leningrad. 1934. 53 pp. ("Architecture for Nurseries. Principles of Plans for the Essentials of Nurseries." By N. S. Nazarova and A. I. Dunaevsky. Published by the Medical Publishing Co. Illustrated.)



SECOND-FLOOR PLAN OF THE AMSTERDAM DAY NURSERY SCHOOL BUILDING



FRONT ELEVATION, DAY NURSERY SCHOOL BUILDING, AMSTERDAM



GROUND FLOOR PLAN OF DAY NURSERY SCHOOL BUILDING IN AMSTERDAM, HOLLAND

A SERIES OF ROOMS FOR NURSERY AND KINDERGARTEN CHILDREN IN A PUBLIC SCHOOL IN PRAGUE, CZECHOSLOVAKIA

Note the suspended radiator and lavatory arrangement

one room with an adjoining bathroom; play and sleeping rooms and toilets for the children 1 to 3 and those 3 to 7, the playroom for the older children having nearly double the space provided for the toddlers.

Wraps, storage for baby carriages and the bicycles of parents and attendants, a room where mothers come to nurse their infants, and the director's office, are all near the entrance door. The second floor is designed for staff living quarters and linen rooms.

The walls are cream-colored and the trim a bright color; curtains are of neutral color with bright bands corresponding to the trim, and the small tables and chairs are red. Linoleum covers the playroom floors.

CZECHOSLOVAKIA

There are several new buildings in the city of Prague which house the groups of nursery children and the kindergartens for children from three to six. One such building visited is a two-story and basement type. It serves children from families having moderate and low incomes, and consequently the equipment includes bathing arrangements and facilities for the preparation of noon lunches.

The principal's office and reception room are near the entrance. The playrooms are entered from the well-lighted corridors and, by a series of connecting doorways, three rooms may be thrown into one long room or separated into smaller group rooms. On the second floor a classroom is converted into a combination auditorium and playroom.

The windows, glass doors, and glass partitions accent the light and sunshine. Racks and hooks in the toilet room provide for individual equipment. For protection the radiators in this room are installed on the walls above the height of children.

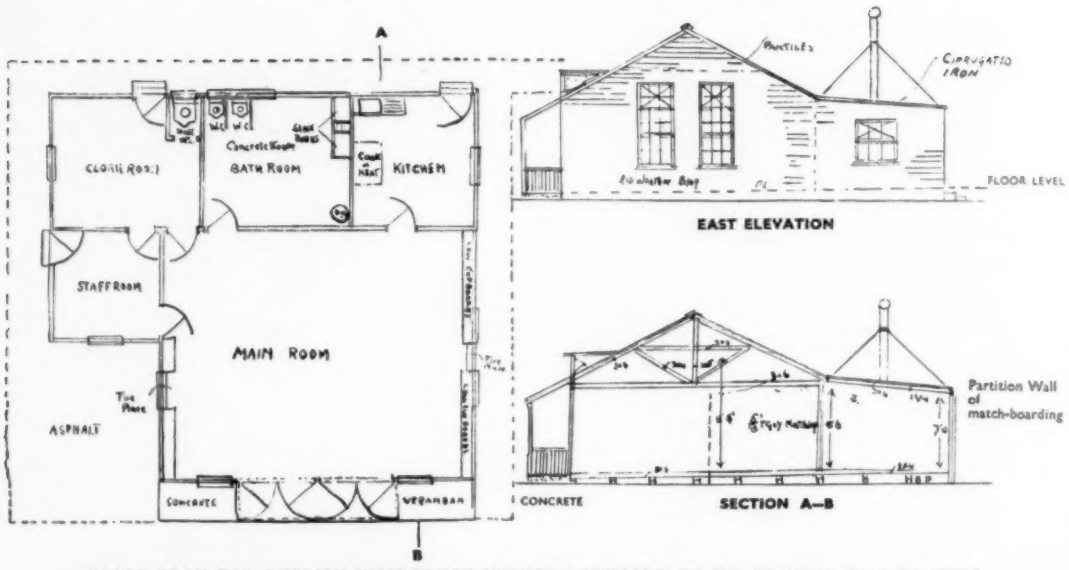
In the basement there is a fully equipped kitchen where the children's dinners are prepared by a staff of cooks and assistants. There is also a well-planned shower-room. Dressing cubicles are against the walls. The central part of the floor is lowered about 6 inches where the children stand under water sprays. A matron is in charge of the bathroom and supervises the "helpers" to make sure the children are independent of adult help. Gardens and an outdoor play yard complete the equipment.

GREAT BRITAIN

School Objectives and Building Standards: The objectives of nursery school education as stated in the report of the Consultative Committee [3] include:

1. To provide healthy external conditions for the children—light, sunshine, space, and fresh air.

[3] "Infant and Nursery Schools." Report of the Consultative Committee. The Board of Education. 1933. 282 pp. His Majesty's Stationery Office, Adastral House, Kingsway, London W.C. 2, England.



FLOOR PLAN FOR ENGLISH EMERGENCY NURSERY SCHOOLS, TO BE ADAPTED TO THE SITES

The building should be in the largest available open-air position, and should have through ventilation and unhindered access to the out-of-doors space. The floor space for 40 children should be approximately 1,000 square feet. The shape of the main room will vary according to site. It should have the largest possible southern exposure

2. To organize a healthy, happy, regular life for the children, as well as continuous medical supervision.

3. To assist each child to form for himself wholesome personal habits.

4. To give opportunity for the exercise of the imagination and the development of many interests, as well as skill of various kinds.

5. To give experiences of community life on a small scale, where children of similar as well as varying ages work and play with one another.

6. To achieve a real unit with the home-life.

Essentials for the building plans which would help meet the nursery school objectives include: [4, 5]

Rooms adapted for a maximum enrolment of 35 children of varying ages between 2 and 5.

Lavatories and toilets as a part of each unit.

An ample site to provide for the building, for gardens, and for playground space; a minimum of 900 square yards for 100 children; 2,083 square yards has been found to be ample space. The site should be close to the children's homes.

The building should face south, and be open-air and one-storied, with uninterrupted access to the garden. It should have verandas at least 6 feet wide to take the place of draughty corridors as a means of connecting the rooms. These verandas should have glass roofs. They must be placed with due consideration for protection from storm winds from the southwest. There should be ample ventilation for the rooms and under the floors, and heating systems should provide an even temperature of 55 to 60 degrees near the floor of the rooms in the coldest weather. Folding doors or "barn doors" with upper and lower portions divided are desirable, and doors opening to the outside should be placed below floor level to prevent draught.

Rooms required in a school designed for 160 to 200 children: a room for each 40 children approximately 40 x 25 feet for play, sleep, meals; isolation room; cloakroom; staff room and toilet; director's office and parents' waiting room; kitchen, pantry and storeroom and laundry.

Room Arrangement: Cloakroom, bath and toilet rooms should adjoin playrooms and be so planned that children can pass conveniently from one to the other on arrival. The kitchen and pantry should be on the cool side of the building and away from cloakrooms.

For 40 children there should be 4 toilets of varying heights with flushing chains long enough to enable the children to manipulate them; ten wash-basins, 14, 17, and 20 inches high, 1 sink-bath and dressing room. Fixed sink-baths should be at least 14 inches deep and 33 inches from the ground; shower-baths are desirable. Individual pegs should be arranged for towels and other equipment 12 inches apart and from 30 to 36 inches high.

The playground should be paved with material that dries quickly; should have grass plots, flower-beds with a paved walk beside them, a sand-pile, sheds for toys and play apparatus. It is also desirable to have a grass bank, trees, shallow steps, bird bath, garden, plot for vegetables, pet hutches, and garden seats.

[4] "Nursery School Buildings and Equipment." Pamphlet No. 17. Part I—The Site, Buildings and Fixed Equipment. Part II—The Moveable Equipment, Apparatus, Toys and Play Material. 25 pp. Revised edition, 1933. Nursery School Association of Great Britain.

[5] "Nursery Schools in Relation to Slum Clearance and Re-Housing." 8 pp. Nursery School Association of Great Britain. Pamphlet No. 27.

Room Design and Equipment Requirements for Sight-Saving Classes

BY WINIFRED HATHAWAY

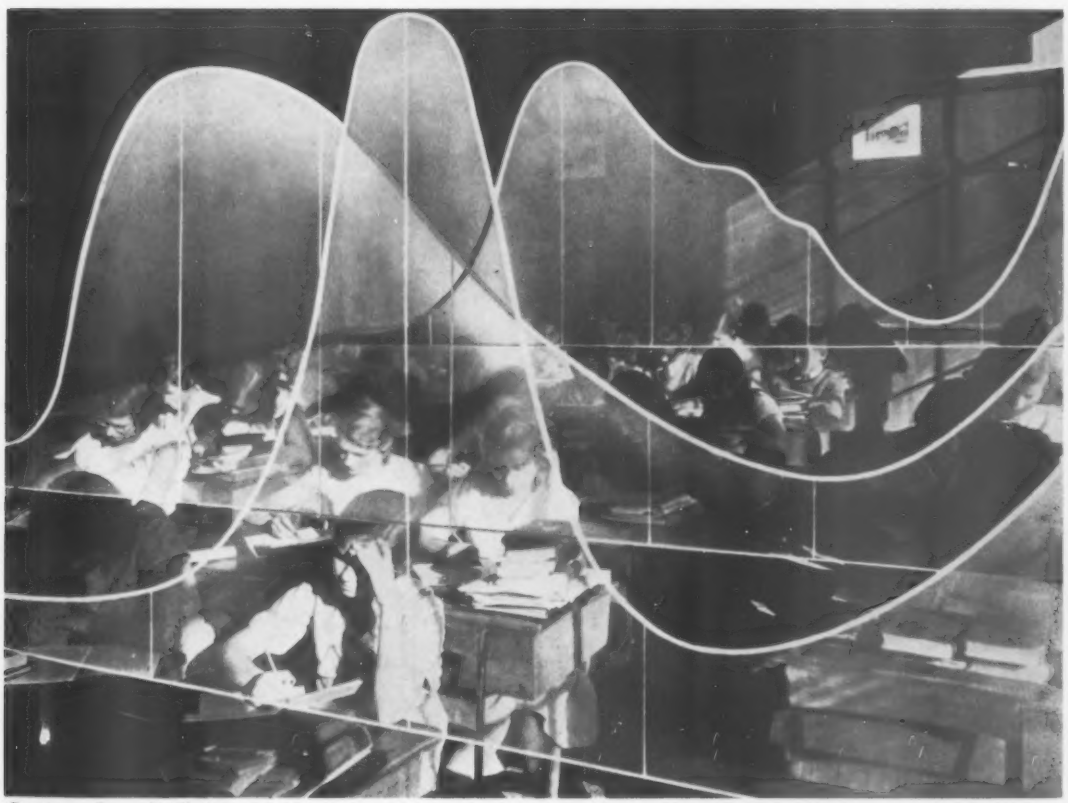
ASSOCIATE DIRECTOR, NATIONAL SOCIETY FOR THE PREVENTION OF BLINDNESS

FOR over two decades, sight-saving classes have been in existence in the United States. As in any new undertaking where there is little or no precedent to follow, the trial-and-error method had to be used for a considerable time, not only in regard to educational methods and material, but likewise in relation to physical equipment and environment of the classroom.

During the years following the establishment of the first sight-saving class in America, in 1913, much consideration has been given to the subject of what should constitute an ideal room: first, because of the results of environmental conditions upon children with seriously defective vision for whom such classes are established; and, second, because it soon began to be realized that many of the principles underlying the most advantageous equipment for subnormal eyes, if applied to classrooms for regular grade children, might prove a potent factor in keeping well eyes well. In reality, the sight-saving class has come to carry this dual responsibility: that of making possible conditions best suited for the education of children with seriously defective vision; and that of serving as an example of conditions most beneficial for general eye health.

Size of the Model Sight-Saving Classroom

Even though the sight-saving classroom is to house a comparatively small number of pupils, it should be as large as an ordinary classroom, approximately 30 x 24 x 12 feet. Not only is it necessary for the pupils to move around a great deal in order to be able to see to the best advantage, but the material used in sight-saving classes is on a larger scale than that provided for regular grades, and therefore requires more space.



Courtesy, General Electric Co.

SUNLIGHT STREAMING THROUGH THE WINDOWS GIVES HIGH INTENSITY WHERE DIRECT SHAFTS PENETRATE, AND LOW INTENSITY IN BETWEEN. THE DISTRESS CAUSED BY GLARE IS SHOWN IN THE ATTITUDES OF THE PUPILS. ADEQUATE CONTROL OF NATURAL LIGHTING IS NECESSARY

Orientation of Room

Correct illumination of any classroom is of the utmost importance. Not only is light essential for seeing: it affects the health of the eye and the general health; educational procedures are often hampered because pupils cannot see well enough to carry on eye work. Recent researches tend to show that east or west exposures give a maximum of light with a minimum of glare. Sometimes school buildings are so constructed that a northeast (*not* north and east) exposure may be obtained. This is ideal for many localities, since it gives the children the benefit of the cheering morning sun and a steady north light for the rest of the day. Southern exposures should be avoided because of the difficulty in controlling the constantly changing light.

A consideration of the outside environment of the classroom is also important. A clear, open space is to be preferred. Ground-floor rooms should be avoided because of the possibility of glare from snow, sand, or other highly reflecting surfaces. Other things being equal, rooms on upper floors are preferable to those on lower floors because of the increase in natural illumination.

Correct illumination, either natural or artificial, is that which provides adequate light for the task, well diffused, well distributed and without glare. The question of adequate intensity is somewhat an individual problem. In general, it may be said that there must be a sufficiently high intensity for the individual to be able to accomplish, without strain, a particular task to be undertaken. It is evident that the condition of the eyes and the type of task will be determining factors in deciding the illumination required. Proper diffusion and distribution of light are essential if an even amount of light is to be provided.

Chief in importance is the avoidance of glare, defined as light which causes a discomfort to the eyes and interferes with the process of seeing. Glare may be caused by a bright light source within the field of vision, by light reflected into the eyes from a polished surface, or by too great a contrast between a light source and its surroundings.

Natural Illumination

Unilateral lighting is desirable, since this reduces cross lights and shadows to a minimum. If it is necessary to select a bilaterally lighted room, windows should be at the left and back of the pupils, with the back windows at a sufficient distance from the floor to prevent shadows on the working plane.

The minimum glass area for any classroom is quoted in "Standards of School Lighting"* at 16 per cent. Since eyes that do not see well need more light than normally seeing eyes, as a compensation for the difficulty, in sight-saving classes this minimum should be 20 per cent; 25 per cent is to be preferred. Since the best light comes from the top of the window, the glass area should reach as near to the ceiling as possible. In order to insure sufficient natural illumination on the desks on the far side of the room, no room should be wider than twice the height of the glass area from the floor.

Experimental work is being carried on to determine the best arrangement for glass area and bastions. Experience, however, up to the present time, would appear to indicate that the best results are obtained from narrow bastions; that the best placement of windows is such that no window will be nearer than seven feet to the front blackboard; that windows will reach as far back as possible in order to provide illumination for the back row of desks; that the sill will be at least three feet, preferably four feet, from the floor.

The most satisfactory control of natural lighting at the present time appears to be obtained by having at each window two translucent, buff-colored shades in soft finish. It has been found that these are effective in diffusing direct sunlight and in preventing glare. Shades in soft finish will not crack and are easily cleaned. The rollers of these shades are placed at or near the center of the window, one directly below the other, the space between them covered by a V-shaped metal bar. Such shades should be wide enough to prevent streaks of light from entering at the sides. To accomplish this, it is usually necessary, unless the windows are deeply recessed, to fasten the rollers on the bastions.

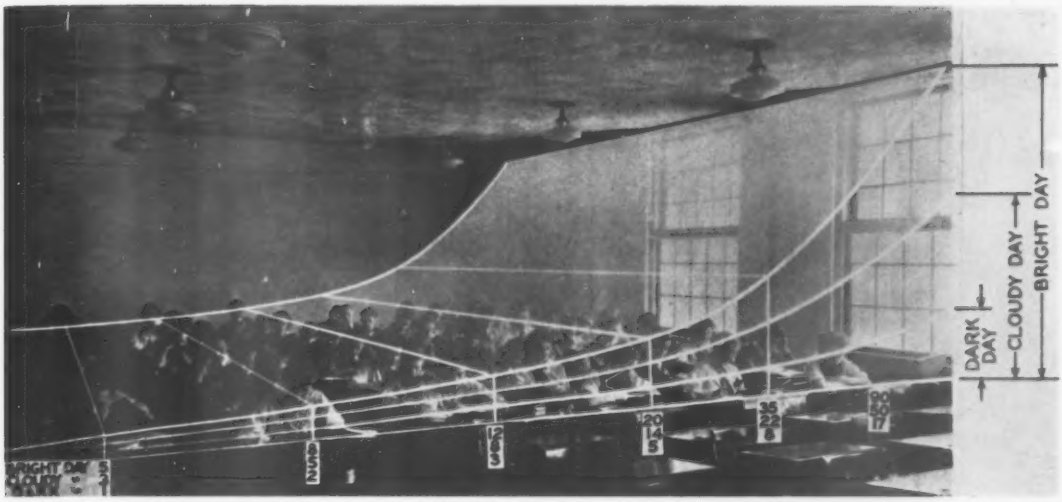
The plan of placing the roller of the upper shade below the roller of the lower shade is impractical. It necessitates fastening one roller considerably further out than the other in order to enable the shades to be operated. This causes a pulling-away of the shades from the window, thus allowing streaks of light to enter at the sides. It is therefore anything but an economy plan, although there may be a slight saving in the initial outlay.

Artificial Illumination

As has already been stated, the eye difficulties that make special educational facilities necessary for children suffering from them, require, in the main, the compensation of higher lighting intensities than are sufficient for the normal eye. It is desirable, therefore, to have such intensity of artificial illumination as will guarantee a minimum of 20 foot-candles of light. It is presupposed that sight-saving classrooms are not used at night; hence, except in very rare instances, even on dark days there will be some natural illumination available. This should be taken into consideration in making installations.

There is no unanimity of opinion regarding the

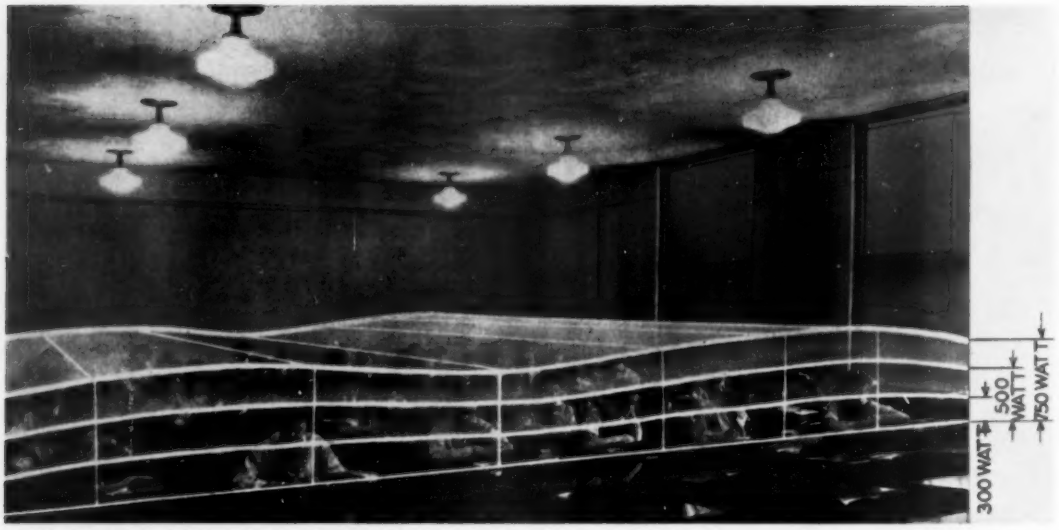
* "Standards of School Lighting," Illuminating Engineering Society and the American Institute of Architects. Illuminating Engineering Society, 29 West 39th Street, New York.



THE FIGURES ON THIS DIAGRAM INDICATE THE NUMBER OF UNITS OF NATURAL ILLUMINATION ON DESKS ON BRIGHT, CLOUDY AND DARK DAYS. THEY SHOW THE NEED OF SUPPLEMENTING NATURAL LIGHTING WITH ARTIFICIAL ILLUMINATION WHEN THE LEVEL FALLS BELOW REQUIRED MINIMUM STANDARDS

Photographs by courtesy of General Electric Co.

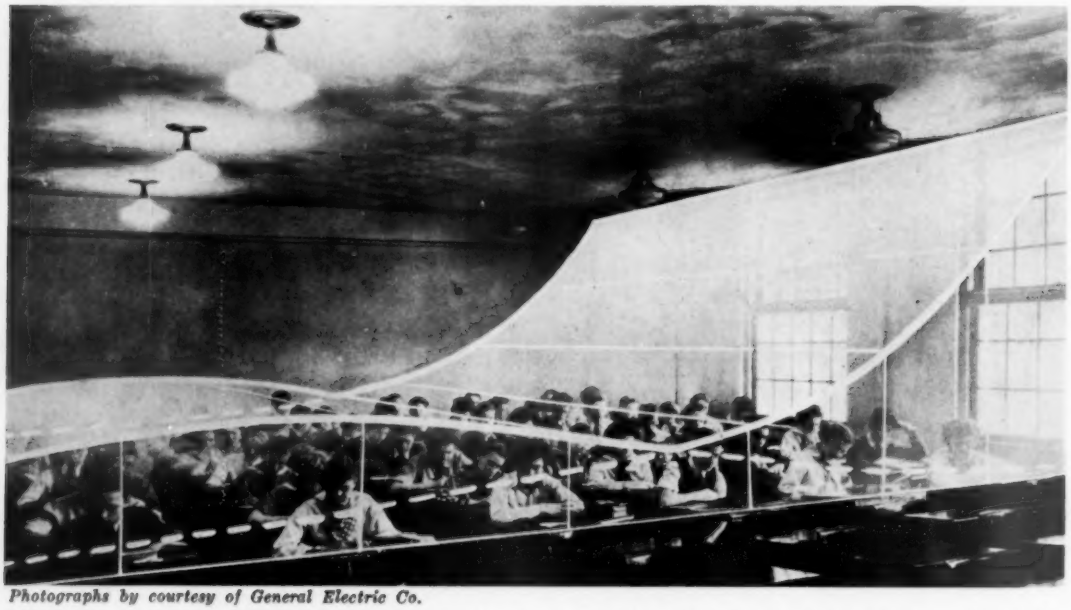
THIS DIAGRAM, SHOWING THE DISTRIBUTION OF LIGHT IN A BILATERALLY LIGHTED ROOM, INDICATES THE VERY LOW ILLUMINATION FROM NATURAL LIGHTING AT THE INNER FRONT CORNER



WELL-PLANNED ARTIFICIAL ILLUMINATION SHOULD GIVE A UNIFORM LEVEL OF LIGHT THROUGHOUT THE ROOM. THE DIAGRAM SHOWS THE DIFFERENT LEVELS OBTAINED FROM LUMINAIRES CONTAINING 300-, 500-, AND 750-WATT LAMPS

type of luminaire best adapted for use in sight-saving classrooms, but the tendency is toward totally indirect illumination, thus obviating any possibility of glare within the field of vision. A few sight-saving classrooms have been equipped with the totally indirect system for demonstration purposes. In these, an intensity of from 30 to 35 foot-candles on the working plane has been considered desirable. Six totally indirect luminaires are hung at uniform distances apart, to insure correct distribution. Each is equipped with a 1,000-watt mazda daylight lamp, or with a 750-watt mazda. In some cases luminaires to control the lighting on blackboards are also installed. These may consist of a row of boxes, each containing a 150-watt lamp. Prismatic cover glass may be used in order to insure good distribution.

In these demonstration rooms a photo-electric cell acts as a guardian of the intensity of illumination. When this cell registers the fact that the natural illumination has fallen below 15 foot-candles on the row of desks nearest the wall,



Photographs by courtesy of General Electric Co.

ARTIFICIAL ILLUMINATION USED ON THE DARKER SIDE OF THE ROOM TO SUPPLEMENT NATURAL LIGHTING IS ECONOMICAL OF EYESIGHT AND OF ELECTRIC POWER

opposite the windows (usually the darkest part of the room), the artificial illumination is automatically turned on.

In other instances, the desired intensity and color of artificial illumination are obtained through the use of luminaires combining mazda and mercury lamps in such a manner as to produce an illumination resembling daylight. In demonstration sight-saving classes using this type of illumination, there are six outlets, each equipped with a semi-indirect inverted bowl, 26 inches in diameter, suspended 28 inches below the ceiling. Each bowl contains a 450-watt, 220-volt, 50-inch A.C. mercury vapor tube used in combination with a 500-watt, 110-volt mazda lamp. There are other combination units used in some rooms having a total combined capacity of 850 watts, instead of the 950-watt combination just described.

Maintenance plays an important part in both natural and artificial illumination. Clean windows and transoms and clean luminaires help to keep initial values up to standard. However, even the best electric lamps deteriorate with use and should be replaced when it becomes evident that the intensity received from them has fallen below standard requirements. An essential part of the equipment of the model sight-saving classroom is a light meter by which the intensities may be measured from time to time; without this, illumination becomes a matter of guesswork.

HYGIENIC, ADJUSTABLE SEATS AND DESKS SHOULD NOT BE CONSIDERED SPECIAL SIGHT-SAVING CLASS EQUIPMENT; THEY SHOULD BE PROVIDED FOR ALL PUPILS

Photographs by courtesy of American Seating Co., Grand Rapids, Mich.

IN THIS ROOM THE DISTRIBUTION OF NATURAL LIGHTING IS NOT PROPERLY CONTROLLED, AND THE RESULTING GLARE IS NOTICEABLE ON A NUMBER OF DESKS IN THE FOREGROUND

Draperies are not advised for classrooms: they do not shut out glare, and they collect dust

Walls—Ceilings—Woodwork

In a temperate zone, buff-colored walls and white ceilings in flat finish will give good reflection values and are more cheerful than gray or green, although these colors may be preferable in tropical and sub-tropical sections of the country.

Woodwork in a sight-saving classroom, as in any classroom, may be in a good neutral tone, or in any desired color that is not fatiguing to the eyes. In all cases, however, it must be in dull finish.

Closets—Blackboards

Built-in closets, large enough to hold the large-sized material used in sight-saving classes, have proved practical for many reasons. Closets that jut out into the room often prove accident hazards for children with seriously defective vision; closets with glass doors are a source of glare.

There are many new types of boards being tried out in slate, silicate and composition material. Colors, too, are being experimented with, chiefly black, white and green. Thus far, slate boards are in more general use than are other types. These require refinishing from time to time if they are to be kept in good condition.

A great deal of blackboard surface is required, since pupils in sight-saving classes do much of their limited close eye work on the boards in order to obtain a good eye focus. Too much black around the sides of the room greatly affects the intensity of light; this is also true where the boards are dark green. Shades the color of those at the windows should be provided to cover them when not in use.

Blackboards in three sections, working on the principle of windows, have proved of great value; they can be pulled up and down so that children may work more nearly at their own eye level than at a stationary board. Also, the teacher may, if she so desires, prepare considerable work on such blackboards and bring the material to the eye level of the children when needed.

Furniture

Manufacturers of modern school furniture are tending more and more toward the construction of hygienic, adjustable seats and desks. The selection of the particular type of desk to be used is a matter of personal preference. There are, however, certain underlying principles that are essential. The seat must be hygienic and adjustable. It must fit the child so that he may be comfortably seated, with both feet resting easily on the floor. A seat that is too deep from front to back causes such irritation that the child sits forward in an endeavor to relieve the strain, thus losing all proper body balance. An open space at the back of the seat must be provided to give room for the thighs, thus bringing the back rest into proper position. There should be no obstruction to prevent the pupil from entering the desk from either side.

The desk top must be adjustable from several standpoints: (1) *Height.*—Some children are tall, others short, from the waist up. (2) *Angle.*—Desks should be so manufactured that they will lift to any desired angle from the horizontal to the vertical plane, in order that books and other material may be at the correct eye focus and that children may sit in correct position. Desk tops should be equipped with adjustable rods so that books and papers may be held in place on the sloping surface in a position in which they may be seen with the greatest eye comfort. (3) *Distance.*—It should be mechanically possible to push the desk top backwards or forwards in order that the distance of the material from the eyes may be adjusted to individual differences.

It is essential that seats and desks should be ordered in correct sizes. There is a tendency to provide for junior and senior high school pupils seats and desks that are altogether too small for comfort. It must be borne in mind that at least some of the children in sight-saving classes will be retarded because of their eye conditions; hence, larger boys and girls will often be found in these classes than in the corresponding elementary grades. This fact must be taken into consideration in ordering seats and desks.

Another point to be kept in mind is that adjustments should be made as necessary to correspond to the growth of the child. All too often seats and desks are adjusted at the beginning of the year and no later adjustments are made.

Seats and desks should be movable so that they may be placed in any part of the room in which the most desirable illumination on the working plane may be obtained. Children in sight-saving classes should be trained and encouraged to place desks so that they will receive the best light on their work. In general, if desks are turned at a slight angle away from the window, there will be less possibility of glare from the skyline. Tables and chairs should be so placed that no child will either face the light or sit in his own shadow.

The choice of the rest of the furniture in a sight-saving classroom will be influenced by the age groups to be accommodated. In all cases there should be work tables and chairs of the same type and color of wood as the desks; a teacher's desk and chair to match the work tables; in case there is no manual training room in the building, a work bench with tools. For lower grade children, a sand table for project work, and at least one easel, preferably two, for brush work, are desirable.

Seats and desks, as well as all other furniture in the room, should be in dull finish, to prevent glare.

Equipment

In sight-saving classes that are to accommodate children above the second or third grades, at least

two typewriters in large type especially adapted for the use of sight-saving class pupils should be furnished, with hygienic typewriter tables, chairs and copy stands. Even in the grades below the second, one of these typewriters should be supplied for the use of the teacher in preparing material.

Books in large, clear type should be selected according to the grades represented. Large-size (9 x 12 inches), slightly rough manila paper; pencils with heavy lead; large-size chalk (1 inch in diameter) in white and light yellow; maps especially suited for sight-saving class work; materials for hand work approved for sight-saving class pupils, are all necessary equipment.

Pupils in sight-saving classes usually have the benefit of advantages offered to regular grade pupils for musical appreciation and radio programs. If such opportunities are not available, the sight-saving classroom should be supplied with a victrola or similar musical instrument. A radio equipment which includes the possibility of using the Talking Book will prove of great benefit, particularly to the junior and senior sight-saving class groups.

Decoration of Classroom

Decoration of the classroom should be as pleasing, but as simple, as possible. A very small number of exceedingly clear, well-colored posters add to the cheer of the room, but a crowded appearance should be avoided. If plants are to be used, they should not be placed in front of windows, since in this position they not only obstruct the light, but are apt to cast shadows.

IMPORTANT FOR REFERENCE

The following articles appeared in the Sixth and Seventh Editions of THE AMERICAN SCHOOL AND UNIVERSITY:

In 1933–1934

Expending the School Stage Lighting Budget
By A. L. Powell, Supervising Engineer, Incandescent Lamp Department, General Electric Company, New York

The Effective Use of Visual-Sensory Aids to Instruction
By Ellsworth C. Dent, Secretary, Bureau of Visual Instruction, University of Kansas

Office Machine Equipment for the School with Moderate Funds
By Grace M. Kennedy, Girls Vocational School, Elizabeth, N. J.

How to Make School Radio Effective
By Kline M. Koon, Senior Specialist in Education by Radio, U. S. Office of Education

College Library Planning
By Edward L. Tilton, Architect, New York

Eye Protection in Every Classroom
By Olive Grace Henderson, Associate in New College, Teachers College, Columbia University; and Hugh Grant Rowell, M.D., Physician to the Horace Mann School, and Assistant Professor of Health Education, Teachers College, Columbia University

In 1935

Trends in Classroom Design and Equipment
By N. L. Engelhardt, Professor of Education, Teachers College, Columbia University

The Planning and Equipping of Nursery Schools
By George D. Stoddard, Director, Iowa Child Welfare Research Station, University of Iowa

Looking Ahead in Radio
By Armstrong Perry

Light—The Connecting Link Between the Eye and Education
By Henry B. Dates, Professor of Electrical Engineering, Case School of Applied Science; Chairman, Committee on Industrial and School Lighting, Illuminating Engineering Society

School Library Planning and Equipment
By Lucile F. Fargo, Research Associate, School of Library Service, Columbia University

Office Practice—An Integrated Laboratory Project
By Edward J. McNamara, Principal, High School of Commerce, New York City

Utilizing Educational Talking Pictures in the Schools
By Frederick L. Devereux, Vice-President, Erpi Picture Consultants, Inc., New York

Forms and Equipment for the Keeping of Student Records
By Ira M. Smith, Registrar, University of Michigan

Designing the Classroom in Terms of the Activity Program

BY EDWIN W. BROOME

SUPERINTENDENT OF SCHOOLS, MONTGOMERY COUNTY, MD.

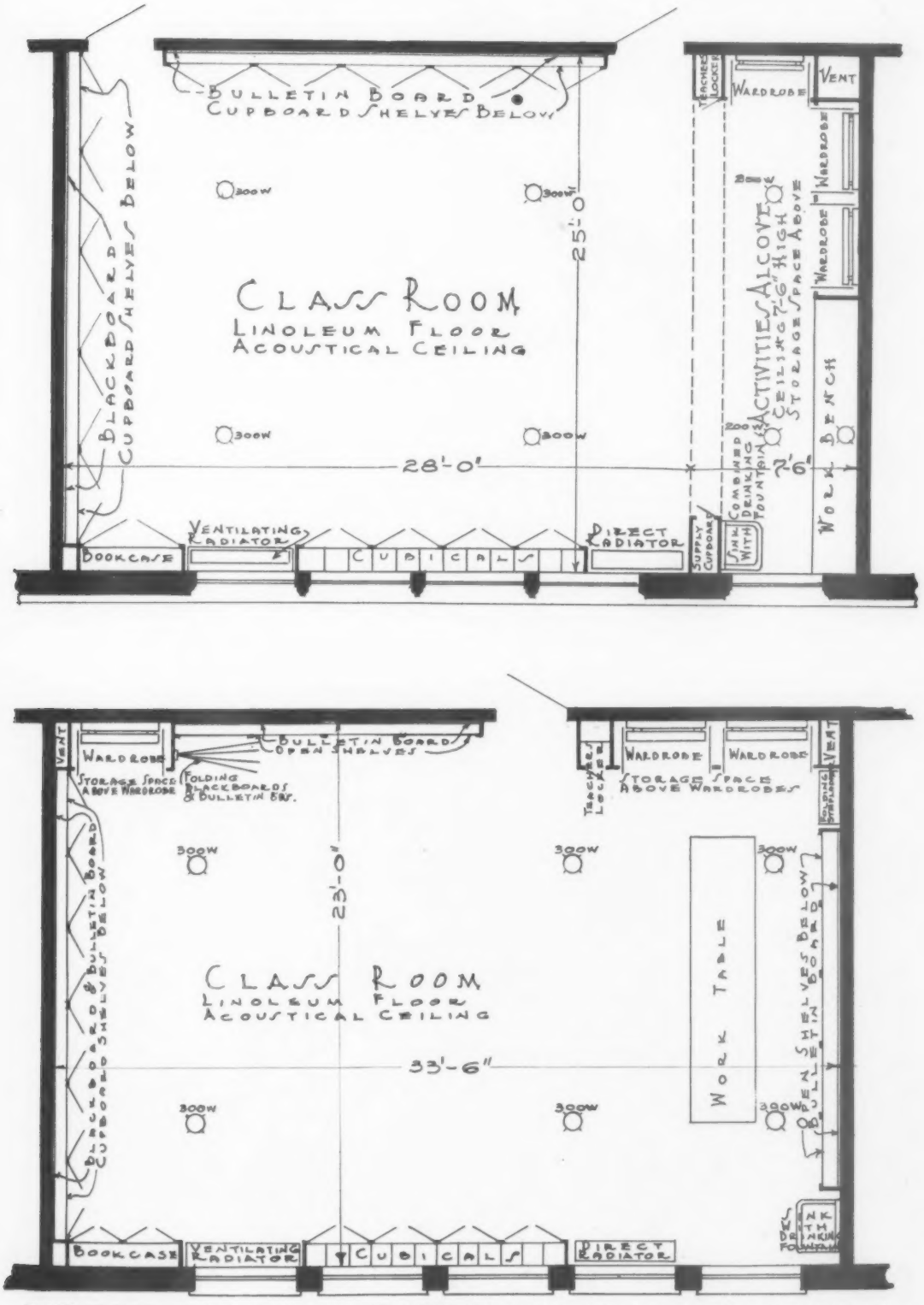
CLASSROOMS are significant, since they tend to promote good teaching. Inasmuch as "good teaching" has expanded to mean many activities going on in the room, the more a classroom can be made to open up possibilities, the more it serves to meet the needs of living education. Teachers tend to make use of things at hand, and if a classroom is stiff and conducive to inactivity, the teacher is very likely to do formal teaching. On the other hand, where a classroom provides for rich opportunities the teacher will tend to develop them. What children wish to do comes about in part from the things around them to do with, so, from the pupil standpoint too, the feel of the room must conduce to doing things.

In providing for more activity, the modern concept of teaching requires more in the way of classroom facilities than was thought necessary in the past. Activities involve the use of more materials and require larger spaces for movement. The traditional classroom, planned around procedures which allowed for no activity or movement on the part of the children, did not permit the freedom of action the present school seeks to bring about. The tendency today, therefore, is to improve classrooms, and the effort is justified.

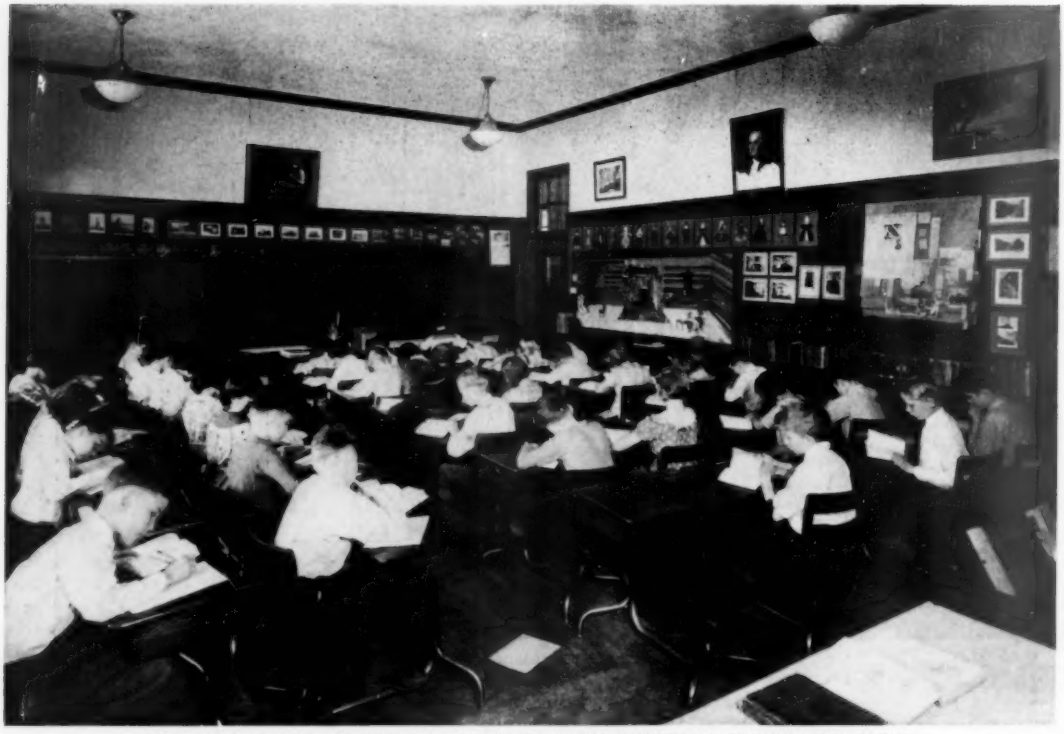
The classrooms illustrated in the pictures and drawings have come about by revising and improving the plans for new buildings, in an effort to provide classrooms to meet the requirements of modern teaching. A few things stand out when planning a room for activities. There must be work space, and this requirement is satisfied by the work space provided at the rear of the rooms. Storage space for materials will be required, and space to exhibit materials after they are worked on will certainly be needed. In studying the plans, one notices that all wall spaces have been used, either for providing storage cabinets or for display purposes. The room must eliminate the possibility of disturbing noises and distracting sounds coming from movements on the part of children. Linoleum floors and acoustical plaster on the ceiling produce the quietness needed in the room, and the finish and color tones have been made soft and pleasing.

While a classroom is permanent in structure, its functional use should be flexible so that a growing philosophy may be met. What the future will bring about in the way of richer possibilities, no one can forecast. It is clear, however, that the future will not make for fewer possibilities, and consequently classrooms should provide for expansions and future needs.

HAT AND COAT CABINETS IN AN ELEMENTARY SCHOOL IN MONTGOMERY COUNTY, MARYLAND



PLANS OF TYPE "A" (ABOVE) AND TYPE "B" ELEMENTARY CLASSROOMS IN THE MONTGOMERY COUNTY, MARYLAND, SCHOOLS



SIDE VIEW OF CLASSROOM IN A MONTGOMERY COUNTY ELEMENTARY SCHOOL

VIEW FROM REAR OF CLASSROOM SHOWN ABOVE

GROUP WORK IN A MONTGOMERY COUNTY ELEMENTARY CLASSROOM

ACTIVITIES IN THE ALCOVE

School-Building Structure and Equipment for Efficient Use of Visual Aids and Radio

BY WALTER C. MARTIN

ARCHITECT; SUPERINTENDENT OF SCHOOL BUILDINGS, BOARD OF EDUCATION, CITY OF NEW YORK

THE value of visual-sensory aids in the pedagogical field has been demonstrated by both research and practical application. Stereopticons, both for opaque projection and for use with slides, are very widely used; since they may be operated at any desired speed, they are admirable aids for lecturers. Motion pictures with speed fixed to maintain the illusion have likewise proved most effective, both with and without sound. The problem before the schools, therefore, is not whether to employ these new teaching devices, but how to plan rooms and buildings for their most effective operation.

Obviously, the type of equipment to be installed in a given institution determines in large measure the operating conditions that are necessary for successful application of the technique. While for small groups slides and small pictured movies may be shown in partially darkened rooms, a completely darkened room is necessary for the use of large pictures with the stereopticon or for 16-mm films. Whether with sound or with silent projection, 35-mm films must be shown from a fireproof motion picture booth. The aim of this article, however, is to point out underlying principles that determine the success or failure of any of the several types of visual aids. Each problem, however, requires individual solution.

Instruction by means of visual aids requires the coordination of two of man's most important senses, sight and hearing. Both must be satisfied, even for pupils who are subnormal in either sense. A certain screen brightness may be ample for the average pupil, whereas an increase would benefit another with less acute vision. This principle applies also to sound, but the acoustics of any room definitely limit the permissible volume of sound and may very easily ruin the quality. Quite clearly, therefore, a careful study of the fundamentals of hearing and vision should be prerequisite to any decision regarding layout or equipment for the use of visual aids.

AUDITORIUM OF THE BROOKLYN TECHNICAL HIGH SCHOOL

The organ loft will have three-color effects for enhancement of stage and musical presentations

LOOKING FROM THE AUDITORIUM STAGE IN THE BROOKLYN TECHNICAL HIGH SCHOOL
In addition to two complete 35-mm sound film machines, the auditorium contains balcony spots and a four-color tube-controlled stage switchboard

The Problem of Extraneous Noise

Interfering noise has two effects on hearing sound. One is the psychological factor of annoyance, which distracts the attention of the listener. The other is the physiological effect, which temporarily deafens the auditor. This latter effect is called "masking," and in the presence of noise, a greater degree of loudness of the original sound is required for equal articulation or ability to understand.

Extraneous noise may be due to internal causes, such as ventilating apparatus, elevators or other machinery in the building. Squeaking chairs, restlessness in the audience, movement in the aisles, on stairs, in adjacent rooms or corridors, are all to be considered. From the outside come noises from street, railways and adjacent factories, and these quite readily find their way through windows. Although figures show that a large percentage of the heating plant capacity is necessitated by loss of heat through large windows, schools have always been built for an abundance of natural light. Large windows are also adapted to an imposing design. So, with the necessity of effective window shades for aiding both reflected and transmitted sound and eliminating extraneous light, comes a conflict with the established architecture of school buildings.

The Problem of Correct Acoustical Conditions

Under the head of acoustics we are concerned with reverberation and echoes; also distortion due to unequal absorption of different frequencies. Reverberation is the successive reflection of sound from walls or floors to ceilings, and vice versa. If the walls or ceilings are of highly reflective material, the sound may be prolonged for several seconds after the source has stopped. If a reflected sound reaches the ear only 1/17th of a second after the direct sound, an echo is produced. Although a limited amount of reverberation is desirable, authorities state that excessive reverberation is responsible for the acoustical defects of otherwise faultless buildings.

The acceptable period of reverberation is determined by two major factors. The first is the maximum amount of overlapping between syllables which can be tolerated. This obviously limits the greatest amount of reverberation permissible. The second factor is the least amount of sound energy which is necessary for satisfactory audition —the lower limit where further reduction in reverberation would bring about too great an impairment in loudness. Between these two extremes lies a range of values that is termed acceptable. Since the period of reverberation varies with the audience, the correction should be so designed

MUSIC ROOM IN THE BROOKLYN TECHNICAL HIGH SCHOOL
Showing ornate grillies for small-sized baffles, and the screen partly unrolled

that for all sizes of audience the periods will lie within the acceptable range. This is the purpose of the so-called "optimum times" as presented by various investigators. The procedure in nearly every case has been to test and analyze auditoriums which were generally conceded to have satisfactory acoustics for all audiences, and to select the value calculated for the average audience as being the optimum.

An acoustical survey is made by means of known frequencies being impressed on loudspeakers. These noises are picked up by exploring microphones. The microphone input is recorded by a stylus on a synchronously operated wax paper. This paper is graduated in decibels, and the stylus records the changes in sound intensity. Where the expense of an acoustical survey is not permissible, as is frequently the case with existing auditoriums, Sabine's formula may be used, and it may also be used before construction with reasonable accuracy.[1]

It should be remembered, however, that acoustics is a rather complex study; sometimes not all acoustic deficiencies are evident in a theoretical analysis. This is particularly true in large auditoriums, since discrepancies between the actual and the theoretical conditions increase rapidly with size. A recent case is recorded where the time of reverberation given by Sabine's formula was 35.5 seconds for the Madison Square Garden. Eyrings formula showed 35 seconds. Yet the measured time given by a reverberation meter was less than ten seconds. Surveys on auditoriums of school size have, however, checked Sabine's formula very closely.

Naturally, an ideal auditorium could be used universally regardless of the size of the audience. In theaters effort is made to make seats have the same effect acoustically whether occupied or not, which necessitates upholstering. Interesting in this connection is the work of Dr. J. P. Upham, who as early as 1853 gave a rather lucid exposition of the phenomena of both reverberation and resonance in auditoriums. He realized that reverberation must be adequately suppressed, and that resonance must be carefully preserved. He conducted some experiments in the main apartment of the Boston Music Hall, a room 130 feet long, 78 feet wide and 65 feet high. He observed the customary changes of reverberation as the soft scratch coat and the hard finish coat of plaster was applied to the walls and ceilings. He further observed that the installation of upholstered benches, the laying of carpets in the aisles, and the hanging of curtains around the windows, reduced the reverberation to a satisfactory condition. The advancement of the art since that time has been to further reduce reverberations by

[1] By this formula: $T = \frac{.05V}{A}$

Where T = time of reverberation in seconds;
V = volume of room in cubic feet;
A = total absorption of room in Sabines.

A sabine is taken as the absorption of 1 square foot of area of an open window. "A" is computed by multiplying each square foot of exposed surface in the room by the coefficient of absorption for the material of which the surface is composed, plus an allowance of 3.6 sabines for each child up to 4.7 sabines for each adult member of the audience less the sabines allowed for the occupied seats.

The data for the absorption coefficients of various materials can be obtained from textbooks, Bureau of Standards publications and acoustical material manufacturers' bulletins, as also can the optimum time of reverberation for rooms of various sizes.

acoustic plasters, etc., but the necessity for drapes and upholstering continues to this day. Great care must be used in the installation of such materials, however, for good acoustics is not obtained by putting sufficient sound absorptive matter on either walls or ceiling. It is possible to get too much sound absorption or to place sound absorptive material in an improper location.

Factors of Auditorium Design

There are certain criteria which may be followed to advantage in auditorium design. The length of the floor plan should not be less than the width or much more than one-and-one-half times as great. Curved walls and ceilings often produce echoes and may cause "dead" points.

Many factors affect the volume of the school auditorium. It might be desirable to standardize on an approximate volume of 150 to 200 cubic feet per seat. If speech without reinforcement is a controlling factor in the acoustic design, the volume should be as small as other conditions permit, but certainly not less than the absorption of the audience and all absorptive surfaces indicate in terms of a satisfactory time of reverberation.

The Selection of Equipment to Obtain the Proper Volume of Sound

There are many reasons, including physiological considerations, for keeping the volume of sound to as low a level as possible, and this principle is borne out in standard practice. A recent survey of 25,000 theaters revealed that the volume under proper conditions is kept surprisingly low.

Low level of sound volume would seem to indicate low power; nevertheless, only a powerful amplifier operated at low level can give desirable results. This can be accomplished only by correct acoustical conditions and freedom from extraneous noise.

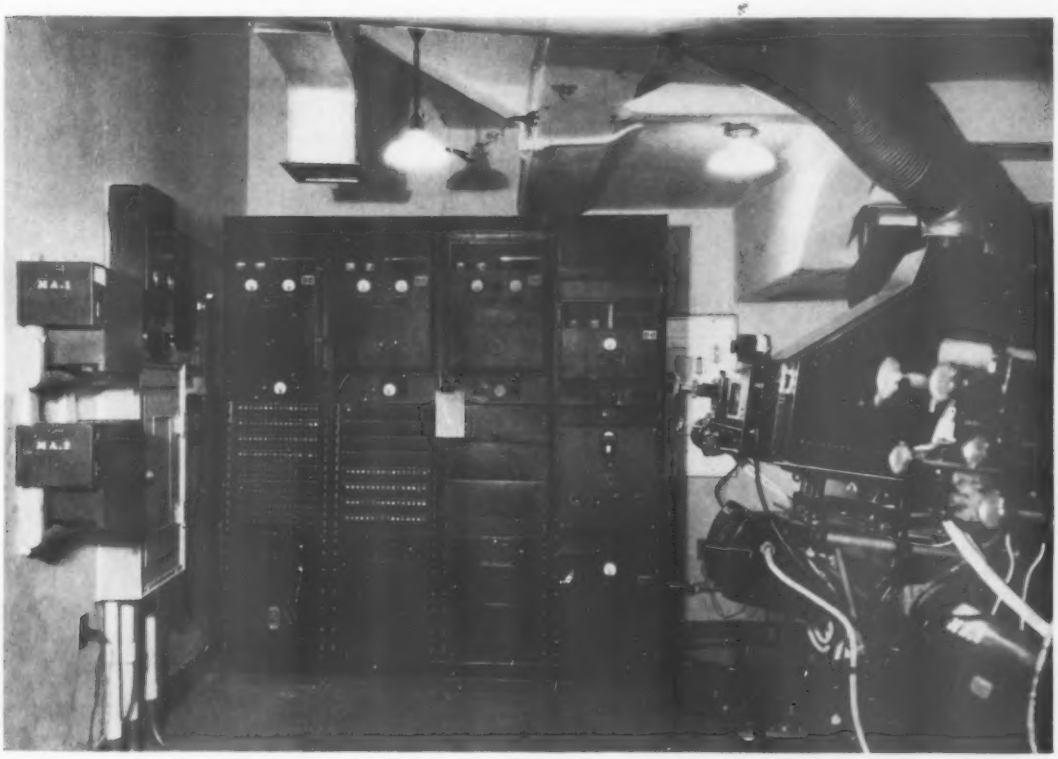
Acoustic power is measured in decibels and is equal to .006 electrical watts at zero level. Sound intensity is also measured in decibels and is equal to 10^{-16} watts per square centimeter at zero level. Sound equipment manufacturers use the power decibel to rate amplifier output, whereas the intensity decibel is used for sound level measurement in acoustic surveys to determine the optimum sound level.

Table I shows the relative level of common street noises (Galt).

TABLE I

The threshold of painful sound	130	db.
30 feet from a steel riveter	100	"
20 feet from an "L" train	90	"
Noisy street traffic N. Y. C.	80	"
Average street noise N. Y. C.	60	"
Minimum street noise N. Y. C.	40	"
Average whisper in a quiet garden	20	"
Rustle of leaves, quiet breeze	10	"
Threshold of audibility	0	"

Table II shows the decibel equivalent in electrical watts. Each increase of one decibel means a



MOTION PICTURE BOOTH IN THE BROOKLYN TECHNICAL HIGH SCHOOL

25 per cent increase in power; each 3-decibel increase requires double the amount of power.

TABLE II

Decibels	Electric Watts
0	.006
1	.0075
2	.0096
3	.012
6	.024
9	.048
18	.382
24	1.5
27	3.0
30	6.
32	9.6

A screen in front of the speakers may absorb 1 or 2 decibels. Loudspeakers are generally not over 20 to 25 per cent efficient; hence the acoustic power is appreciably less than the electrical power expended.

Loudspeakers are placed to maintain the illusion of the voice coming from the screen and yet remain inconspicuous. In new buildings ornate grilles of at least 50 per cent air openings have been used for smaller-sized baffles, such as in the music room of the Brooklyn Technical High School. For the larger-sized horns, a portable framework is required. Directional baffles permit the absorptive power of the audience to be utilized, whereas the flat baffle directs the sound at the ceilings and walls. In untreated condition these are highly reflective and the percentage of audibility is decreased.

The Selection of Screens

For school purposes a matt surface screen is generally to be recommended, because in a properly designed auditorium a more uniformly lighted picture is obtained over a wider range than with either metallic or beaded screens. Either metallic or beaded screens will give a much brighter picture within narrow limits of vision, but this feature is not desirable except in long, narrow auditoriums. The bead screen could be used in classrooms when it is possible to group pupils in front of the screen; but because of the tendency toward glare in the highlights of the picture, eye strain might result. Metallic perforated screens have long life and ease of maintenance. If a room is set aside for visual aids, such a screen might be permanently placed, with many desirable results. In buying screens it should be remembered that screens are not often "flown" full size except in theaters. In most school stages the headroom is so low that the screen must be rolled up. Consequently the fabric must be pliable enough to permit rolling and unrolling without damage to the finish surface.

Size of screen is admirably discussed in the *Journal of the Society of Motion Picture Engineers*, September, 1931:

"The distance between the front row of seats and the screen is one determining factor for the size. The larger the picture, the more plainly imperfections in the film, such as graininess, show up. This is very noticeable and objectionable in the nearer seats. Also, since the eye can satisfactorily accommodate itself to movement throughout a 60-degree angle, the distance between the front row and the screen should approximate 0.87-foot for each foot of screen width. For a 15-foot picture, a distance of at least 13 feet should therefore be provided.

"The size of picture should be determined by its distance from the rear seats. The width of the screen should be equal to approximately one-sixth the distance from the screen to the rear seats. For a distance of 120 feet, therefore, a 20-foot picture should be used, provided there are no seats nearer the screen than 17 feet and the projection angle is not very great. These rules are intended only as guides."

Experience dictates that any variation of this rule should favor a smaller rather than a larger picture.

How the Foregoing Principles May Be Applied in Modern Construction

A recent survey discovered an example of what may be done in modernizing an existing building to obtain correct conditions for the use of visual aids. An idle classroom of an out-of-town school was converted into a projection room by means of interior partitions to close out extraneous sound and light. Unit ventilation was provided and the ceilings were soundproofed.

The newly constructed Brooklyn Technical High School, built to house 6,000 pupils, provides means for taking full advantage of visual-sensory aids both for classes of the present size and for groups of several hundred pupils. To avoid noises from the downtown area outside, the auditorium is built in an inner court entirely without natural light. The windows added for architectural effect are artificially illuminated. The shops and foundries are placed, of course, at the end nearest to the greatest line of traffic. A 150-kw high-speed motor generator set is used in the foundry on the seventh floor, but a suitable vibration absorption base prevents the transmission of noise of any of the floors below. The auditorium is equipped with 3,000 upholstered opera chairs, which give an acoustical effect equal to the optimum time of reverberation. The two hundred or more classrooms are equipped with three channel amplifying systems for radio, public address and musical programs. The music room and the industrial chemistry lecture rooms also have motion picture equipment for 35-mm sound films.

Visual Aids of the Future

Recent progress in motion pictures has been toward bi-naural effects, the introduction of color, more natural reproduction through utilizing sound network, and speakers with selective frequency response. These improvements will undoubtedly be reflected in up-to-date films and projection equipment. Architecture as well as industry will have much to do with the progress of visual aids, however, for to take full advantage of the progress in equipment, the architect will have to consider factors of design in a new order of importance.

The Physical Administration of the Book Collection

BY WILLIAM M. RANDALL

PROFESSOR OF LIBRARY SCIENCE, GRADUATE LIBRARY SCHOOL, UNIVERSITY OF CHICAGO

IT is the business of any library to collect and preserve books and to make them accessible to readers. With the actual collecting of books—that is, their selection and purchase—the administration of a physical plant has little to do. Books do not become a problem for the physical plant—except in one regard, which will be noticed later—until they have been added to the collection. But with the other two functions the physical plant is concerned. The administration of the book collection as a physical unit is the only answer of the library to the problems of its preservation, and this administration plays a considerable part in the third function—that of making the books accessible to the readers. It is therefore most important that it be efficiently performed.

STUDY CARREL, UNIVERSITY OF TEXAS LIBRARY

Protection Against Fire

The preservation of books depends on several factors. One of these is protection against fire hazards. Although it may appear that this is a fundamental consideration and one which should be thought of first in any plan for a library building, the fact is that in 1930 more than half of the libraries of colleges in the United States were housed in non-fireproof buildings. More striking perhaps is the further fact that even after 1930 colleges were still constructiong non-fireproof plants for their libraries.[1]

This probably needs no comment. With the possibilities for the construction of fire-resisting structures as they are, it is obvious folly to entrust a book collection which represents a large outlay in money and effort to inadequate protection in this respect.

[1] Randall, "The College Library" (Chicago: University of Chicago Press, 1932), p. 35 f.

INDIVIDUAL STUDY COMPARTMENTS, WIDENER MEMORIAL LIBRARY, HARVARD UNIVERSITY

Wooden Shelves

Library buildings are generally built to be used for a considerable period of years. More often than not they have a memorial or monumental significance to the institution. Since this is true, some thought should be taken of the durability of the materials with which they are constructed. This consideration is important with respect to the equipment for the shelving of the books themselves. The various types of wooden shelves now in use in the stack rooms of many college libraries are unsatisfactory from this standpoint of durability. Wooden shelves, because of their ornamental possibilities, are probably suitable for reference and reading rooms.

Wooden shelves in the stacks are unsatisfactory from another and perhaps more important standpoint as well. The equipment for the shelving of the book collection in an academic library must be easily adjustable. Books of varying heights have to be accommodated, and different subject divisions of the collection grow at different rates. It is continually necessary to adjust and move shelves to fit a growing collection.

ROLLING CASES, TORONTO PUBLIC REFERENCE LIBRARY

Steel Stacks

These various considerations make it highly advisable to provide modern steel stack construction for the shelving of the book collection. In planning such an equipment, experts in stack construction should be consulted. Steel stacks are made in units of uniform sizes. The building should be planned to fit them in such a way that available space is utilized as completely as possible. For example, ceiling heights are important. In too many cases architects unskilled in library construction have caused the building of stack rooms with permanent ceilings at heights which preclude economical and effective book storage. A permanent 12-foot ceiling will waste space which might have been used. It is better to construct the portion of the building to be used for the stacks as an open well and to allow the stack company to furnish floors, stairways, etc., besides shelves.

Air Conditioning

Besides the actual stack equipment for the shelving of the book collection, certain other factors are important in the preservation of the book collection. Foremost among these are heat control, humidity control, and purification of the air.

Books are best preserved under conditions of heat and humidity within a temperature of from 70° to 85° F., and a relative humidity of from 45 per cent to 55 per cent.[2] A positive circulation and diffusion of air through the stacks is also highly desirable.

Besides these provisions for the control of temperature and humidity, the washing of the air is desirable, particularly in urban libraries for the purpose of removing dust and various polluting fumes which are highly injurious to books. The United States Bureau of Standards has conducted a thorough study of conditions in libraries with respect to these factors.[3] The results of these studies show the advisability of providing, at least in urban libraries, adequate air-conditioning machinery.

STEEL COLUMN BRACKET STACK WITH HINGED OPEN BAR SHELVES, UNIVERSITY OF TEXAS LIBRARY

Provision for Normal Growth

One more problem having to do directly with the storage of books is that of planning a stack of adequate size to accommodate the book collection and at the same time to provide for its normal growth. The capacity of stacks may be figured in several different ways. On a basis of floor area, it is unsafe to plan on the accommodation of more than fifteen

[2] B. W. Scribner, "The Preservation of Records in Libraries," *Library Quarterly*, Vol. IV (July, 1934), p. 377.

[3] See *Library Quarterly*, Vol. I, p. 409 ff.; Vol. IV, p. 371 ff., as well as the actual reports of the Bureau of Standards, Paper Division.

books per square foot. In a college or university library, seven books to the linear foot is the largest safe estimate. In terms of stack ranges, which are usually seven shelves in height, it is possible to count on fifty volumes per foot, although holding to this figure throughout the library will probably result in crowding.

The normal experience in the rate of growth of college libraries leads to the conclusion that a new library building should be planned to accommodate not less than twice the number of books in the collection when the building is built. Future experience may alter this conclusion. It is not impossible that libraries in colleges will grow at a lesser rate than this, and that the necessary provisions for growth will be to some extent limited.

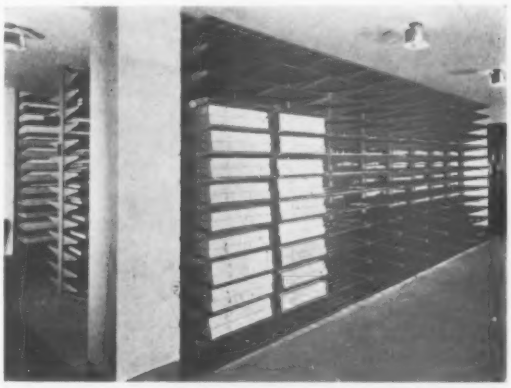
FOLIO SHELVES IN THE LIBRARY OF THE UNIVERSITY OF MICHIGAN

If conditions of finance or other factors make it impossible to construct at the outset a building which can be expected to care for the future growth of the collection, some provision must be made for its later enlargement. The methods available for this will of course depend upon the style of building and the terrain. Usually it is easier and less costly to plan an extension of the stack room upward than to contemplate one which calls for increased area. But it must be borne in mind that tall stacks are expensive in operation and that they may interfere with the architectural harmony of the campus.[4]

Service to Readers

The accessibility of the books to the readers as well as their preservation depends to a large extent upon the administration of the book collection.

[4] For a detailed discussion of building problems, see J. T. Gerould, "The College Library Building" (New York: Scribners, 1932).



STEEL BRACKET TYPE NEWSPAPER STACKS WITH OPEN BAR SHELVES AND INVERTED SHELF END BRACKETS, E. L. DOHENY MEMORIAL LIBRARY, UNIVERSITY OF SOUTHERN CALIFORNIA

Of primary importance here is the arrangement of the books in the stacks. No matter what bibliographic classification may be followed, it must not be allowed to interfere with convenience of use. The books which are most used should be nearest the delivery desk even though this displaces them from their normal position in the classification.

Stairways giving convenient communication between floors, book lifts, and elevators, and perhaps a book conveyor in larger libraries—all these are important in speeding up the service to readers

This and preceding photographs by courtesy of Snead & Co., Jersey City, N. J.

STANDARD TYPE A BOOKSTACKS, NORTHWESTERN UNIVERSITY

Courtesy of Holophane Company, Inc., New York

LIBRARY STACK LIGHTING AT LANGDELL HALL, HARVARD UNIVERSITY

and in cutting the costs of administration. Architects and specialists in stack construction are the best advisors in details of this sort. Their experience and the results of their investigation should be utilized by any one attempting to plan a library building.

Lighting in the Stacks

Lighting in the stacks is another factor to be considered with care. While good natural light is to be desired in reading rooms, it is not of equal importance in stack rooms. As a matter of fact, direct sunlight is highly injurious to both paper and leather, and books should be protected from it. Much work has been done of late on the general problem of stack lighting. The results of this research may be seen in operation in the new buildings at Yale and Columbia Universities as well as elsewhere.

So far as the books themselves are concerned, two things are of importance. First of all is their order on the shelves. This must be maintained by a routine which periodically covers the entire collection and sees to it that every book is in its proper place. A book misplaced is a book lost to use. What the librarian calls "reading the shelves" becomes therefore of great importance. This can usually be done by non-professional assistants after some training and with a certain amount of supervision.

The business of getting the books from the stacks and into the hands of the reader is also a matter for consideration. This, too, is most economically done by trained student assistants. The same people may be expected to replace the books on the shelves when they have been returned after use.

All this work requires supervision. It must not be allowed to drag or pile up. Books must be returned promptly to their places so that they may be used again. The more mechanical and routinized these processes may be made, the better.

The admission of students to the stacks is another problem which confronts the administrator. Of late there has been considerable agitation for the so-called "open stacks." The cost of such service in misplaced and lost books and in necessary supervision is apt to be large. It is doubtful whether confronting a student with the large collection of books in the stacks serves as an incentive to reading. It is altogether possible that smaller selected collections on open shelves are more useful in this respect. Certainly their cost in administration is much less.

Equipment of the General Business Training Classroom

BY FOSTER W. LOSO

THOMAS JEFFERSON HIGH SCHOOL, ELIZABETH, N. J.

and

HERBERT A. TONNE

NEW YORK UNIVERSITY

THE suggestions for the equipment of the introduction-to-business room which are offered here presuppose the existence of the basic environmental features suitable for the teaching of such a subject in a secondary school. They presuppose that the room is adequately lighted, heated and ventilated, and is directed by a well-trained teacher, motivated to growth because of her interest in the student. Undoubtedly, this primary requirement sounds elemental, but too often the failure of a project can be directly traced to the absence of one or more of the things which we expect to find in the modern school.

Objectives of the General Business Training Course

Before one is able to determine the subject matter, methods, devices and equipment to be used to teach a subject, the objectives or scope of the proposed subject should be ascertained. The aims in a subject as well stabilized as introduction to business are nevertheless general in interpretation, varying only in degree of emphasis in the schools where the subject is offered.

The aims and objectives of the course as set forth in the New York State Course of Study under the title, Introduction to Business, are as follows:

1. To develop an appreciation of the functions of modern business and the interrelations between it and the world in which we live, so that the pupil may better understand his own relations with business regardless of his present or future activities.
2. To serve as a basic course for the study of business.
3. To develop proper attitudes, appreciations, habits, and knowledges "through materials in themselves worth while."
4. To prepare pupils who must leave school to enter business before completing their high school course, for work within their capacities and abilities.
5. To serve as a means of educational and vocational guidance.

These aims as listed are typical of the better thinking of the purposes of the subject. They minimize vocational training, as such, and emphasize an understanding of the basic purpose and place of business in our economic life. As a subject of general rather than specialized value, teachers of general business training are not justified in asking for highly differentiated equipment and classroom floor plan. Teachers of junior high school introduction to business should be able to present their work in usual classroom conditions just as well as teachers of all other non-specialized subjects. In junior business training as in most other subjects, the most important element in the teaching process is the teacher-and-pupil relationship. Given in addition to this a good textbook, all the basic elements necessary are there.

Nevertheless, all other things being equal, some special equipment will be helpful, and in the case of this subject, the administrator will have little difficulty in providing this equipment, because it is quite inexpensive. The floor plan for the junior business training need be no different from that of any other well-planned classroom. If the administrator believes in the newer child-centered philosophy of education, he will probably not wish to have desks attached to the floor, for in general business training there is abundant opportunity for pupil project work. Apart from this, no special form of classroom can be asked for. A suggestion for a special form of desk is given below.

Available Illustrative Material

Probably no other commercial subject, with the possible exception of office practice, offers more opportunity for illustrative material. The deposit slip, check, bank statement, receipt, bill of lading, voucher, draft, etc., obtainable at any stationery store, business house, bank, or even private dwelling, offer the student a personal contact with the papers invaluable to the teaching of such forms.

Let us not forget the hundreds of pictures relating to business activities appearing daily in newspapers, magazines, and pamphlets. This illustrative material, coordinated with a notebook, makes the course exceedingly instructive and interesting to the wide-awake child. Little if any of this material need be purchased, since it is instructive to the pupil to secure the material himself.

Films and still pictures offer the same service as do the illustrations in a textbook, but with a thousand times more color and interest, owing to the size, novelty, and appropriateness of the selection for the particular situation. Therefore, this

material is as valuable in junior business training as in most subjects. Not as much material is available in the form of slides and motion-picture reels as in some other subjects, but more material is rapidly being developed. Teachers of junior business training should be able to make extensive use of these visual aids either by having a machine in each classroom, or by some program of sharing in the use of such devices with not too many other teachers.

The reference bookshelf in the introduction-to-business classroom should have dictionary, atlas, gazetteer, book of synonyms and antonyms, etc. These can be supplemented with high-school texts in commercial subjects and social studies, for these books form the best possible reference books for junior business training.

If it is difficult for the teacher to obtain or make forms and problems, a workbook pad proves of assistance. Frequently these pads are misused and form a basis for disguised busy work.

Before a teaching device is purchased, the teacher should consider it from several different angles:

First, equipment should possess certain standards—durability, ease of operation, noiselessness, neat appearance, capacity, and compactness.

Second, it should be suited to school conditions, the subject matter, the knowledge of the teacher, and the amount of teaching effort available to teach the operation of the device.

Third, the device or machine should permit the students to attain a degree of success in its use, permit effective integration of old and new learning, allow for individual differences between students, encourage desirable social and educational outcomes, and encourage students to use their new skill and knowledge in their school and after-school activities.

Desks—Files—Other Equipment

Possibly, when the introduction-to-business training-room can be devoted exclusively to this subject, it should under ideal conditions be equipped with small single-pedestal flat-top desks of the type commonly found in business offices. Although this may be an expensive way to equip a room, it will pay in the value and usefulness of the equipment, the feeling of satisfaction developed in the young student and in the fact that such a desk permits any sort of arrangement necessary for a more effective use of the room. It permits, if desirable, the lining-up of desks so that a room can be easily divided into departments; or they can be moved to one side for various types of demonstration. The flat top allows for efficient use of small devices and machines on desks.

The metal file is a valuable adjunct, not only for filing teaching materials but also as an aid in covering the subject of filing. The commonly displayed three-drawer tin file with four drawers at the top for index cards meets the double duty very well. A set of alphabetic guides, geographic guides, numeric guides, several of the different types of folders to illustrate the tabs, the 3 x 5-inch index cards with small index guides, the file-drawer rod and the paper back-stop, lend themselves very nicely for demonstration purposes in the teaching of filing. They can also be used at other times for the filing of teaching materials. The small miniature files now sold by the various file companies and by some book companies assist greatly in making the teaching of filing more effective.

A telephone instrument can be procured from the local telephone company. There is no better way of teaching the student how to dial, how to hold the telephone and how to speak into the mouthpiece than through the use of a real instrument. If the teacher offers an intensive course in telephoning, the use of the switchboard, either in the main school office or as a part of the regular equipment, is absolutely necessary.

A duplicating device, in addition to the use of carbon paper and in conjunction with the knowledge offered to the students, can prove of great assistance to the teacher and to the class. It seems hardly advisable to have more than a simple type of gelatin duplicator. If funds are available, it is possible to teach the more complicated duplicators to students on the elementary business level. Whether this is usually desirable is, however, questionable.

Staplers, pencil sharpeners, paper cutters, baskets, punches, date stamps, mail scales, etc., are also desirable.

The suggestions made in this article give little encouragement for extensive specialized equipment in general business training. The earlier philosophy of this subject conceived of it as a fundamental vocational subject for those who were compelled to enter employment at the earliest possible age. When this point of view dominated, it was highly desirable to have in the classroom the business equipment that might be used by these students when they entered business offices. Now that the subject is thought of as presenting to students an elementary conception of how our economic life functions, rather than as a means of training for junior commercial occupations, the equipment requirements are greatly lessened. The teacher of junior business subjects is far more interested in having his room meet the highest standards of general efficiency and health than in having a lot of specialized equipment of doubtful value in the teaching process.

Equipment for School Dramatics

BY THEODORE FUCHS *

DEPARTMENT OF DRAMATIC PRODUCTION, NORTHWESTERN UNIVERSITY

THE activity commonly referred to as "dramatics" has slowly forged its way to an acknowledged though still somewhat begrudged position in the curriculum of every educational institution in the country that lays claim to the adjectives "progressive" and "modern." To consolidate this position and to dispel the too generally prevalent and insidious academic attitude that "dramatics" is basically recreational in character, it must establish for itself a set of rigorous standards, and then adhere to these itself and insist upon their being respected by others.

Meaning and Purpose of "Dramatics"

Just what the term "dramatics" embraces must first be defined. A brief definition, applicable to the average non-professional school or college, is that dramatics is basic, elementary instruction in the art of the theater, and the training, not necessarily toward the theater as a vocation, but toward a better appreciation of theater art. A discussion of the educational advantages of dramatics, of the unique position occupied by theater art in its being a unified, balanced composite of many of the fundamental art forms, or of the exact content of the ideal courses in dramatics, has no place here. But what does concern us is that dramatics, or instruction in the art of the theater, is a serious progressive study in the comprehension and use of a set of definite techniques, media, instruments, terminology, and standards of accomplishment; and not merely a haphazard, spasmodic pastime; and that the instructor of dramatics must have a background of highly specialized, rigorous training in addition to mere enthusiasm for his work. This conception of dramatics is far removed from the old practice of having the well-meaning but misguided teacher of Latin, for example, indulge a long-suppressed desire for self-expression by staging the annual senior play.

The point of all this is to call attention to and re-emphasize a fact that is constantly being overlooked or deliberately disregarded; namely, that present-day curricular dramatics deserves and should receive the same respectful attention and consideration, on the part of school authorities and the community in general, as are bestowed upon any of the other courses (more hallowed and pontifical in aspect, perhaps, by virtue of their long background of academic tradition) beside which dramatics has taken its place in the curriculum. It should receive equal attention and consideration, then, as regards such factors as prerequisites, course content, instructor-qualifications, standards of achievement, and also, what is of interest to us here, physical facilities.

Dramatics—a course in theater art—needs adequate physical facilities because it is essentially a laboratory course, just as is any course in the arts, or in the physical sciences, or in manual training. Mere classroom study of literary forms of plays, involving their analysis and minute dissection, and perhaps the "elocution" of portions of them, does not, by itself, constitute theater art. Alone it is a dead, barren activity, except for advanced students of literature. A play cannot truly be said to exist, to fulfil its function, until it is being enacted, produced, before an audience. This is basic; even to the Greeks, "theater" meant "a place for seeing," and "drama" meant "doings," or action. The laboratory work of a complete course in dramatics would include the technique of acting—interpretation, body-movement, voice-training, and make-up; of stagecraft—design and construction of scenery, costumes, and properties; of stage lighting; of stage management; of play direction; and, of course, of actual play performance. It is obvious that the laboratory facilities for each of these activities must be not only adequate, but also proper and suitable to the purpose.

Present Organization and Standards of School Dramatics

Unfortunately, such a satisfactory condition exists in only a relatively few cases. Most of the high-school and college dramatics over the country is being taught under very discouraging conditions, and when creditable results happen to be achieved, they have been achieved in spite of, rather than with the help of, the prevailing physical facilities for the work. If in a modern high school today the teacher of chemistry were provided with the crucibles, the retorts, the alembics, the furnaces, and the bellows of the medieval alchemist for his equipment, or if the teacher of zoology were expected to conduct his laboratory work in the domestic science kitchens of the home economics department, the situation would be universally acknowledged as being too ridiculous for words to describe. Yet virtually the exact counterparts of such situations, as applying to curricular work in dramatics, exist in most of the high schools and colleges of the country. Facilities are either non-existent or wholly inadequate, or they may be elaborate, expensive, and seemingly adequate while being actually quite inappropriate and unsuitable.

Why is this true, and whose fault is it? In the first place, the very newness of school dramatics is responsible for its comparative lack of specific

* Theater and lighting consultant; author of "Stage Lighting," Boston: Little, Brown and Co., 1929.

organization and standards, for its lack of specific self-analysis as to its functions, its methods, and its requirements. Only within the last decade have well-trained teachers of dramatics been turned out who were equipped to state, with reasonable precision and authority, what physical facilities they required for their work. And only within the last five years have these been turned out in sufficient numbers to begin building up a general respect for their work and for what they ask to execute it with. In the second place, detailed knowledge of the function, the design, and the coordination of the physical facilities required for school dramatics has not had time to become widely enough disseminated among and understood by the school authorities and school architects of the country whose combined job it is to see that the proper educational facilities are supplied. The average school architect cannot be blamed for being unable to keep up with the details of the highly specialized physical facilities required by modern school dramatics. He is not expected to, any more than he would be expected, in his capacity of general planner, coordinator, and supervisor for his client, to have an intricate knowledge of the details of such phases of building design and construction as steel structure, heating, ventilation, sanitation, or electrical work.

But one cannot help observing that he has been somewhat remiss in not being aware of his lack of modern detailed knowledge of curricular dramatics and its physical requirements. He does not hesitate openly to avail himself of disinterested technical and engineering advisory service in these other phases of his work that have just been referred to, for general advice and detailed planning. But seldom will he acknowledge to himself that school dramatics has achieved an important or deserving enough position in the educational program to warrant bestowing more than cursory attention to its needs, or satisfying these needs in better than the outmoded, conventional manner. And only rarely will he admit that he is not a complete master of both the general ideas and the specific details necessary to provide adequate facilities for school dramatics in its modern conception, even when such facilities are insisted upon by school authorities. Or if he does happen to admit the need of advisory service, rarely will he turn to sources other than those that offer their ideas free of charge because they have merchandise to sell; fresh enough merchandise, perhaps, in many instances, but smothered in stale ideas in practically all instances.

It is certainly more generally satisfactory and more economical in the end to call in an experienced, disinterested advisor; and to call him in when plans are still in their preliminary, fluid stages; and to depend upon his specific recommendations in this particular phase of school planning. There are literally hundreds of school auditoriums and stages throughout the country which are such horrible monstrosities that they are the despair of all those persons who are forced to use them in connection with school dramatics. Such conditions in old buildings are perhaps understandable, but when they are encountered in buildings that have been recently constructed, they constitute mute but decisive evidence that the architects responsible for them have been utterly unacquainted with, or deliberately neglectful of, the functions and requirements of school dramatic activities. Such conditions are inexcusable and are entirely avoidable. The following discussion is an attempt to outline some of the major points that must be taken into consideration when facilities for modern curricular school dramatics are being planned, if the results are to be at all suited to the functions.

The physical facilities for school dramatics can be classified into three main groups—the auditorium, the stage, and the workshops; and each of these can be discussed from the standpoint of function, size, shape, equipment, and relationship to the other units. Each school presents a different set of problems, and hence specific recommendations cannot well be given. The general recommendations that follow are universally applicable, and are presented more or less in the form of an annotated check-list with definite suggestions and precautions.

The Auditorium

The demands made upon a school auditorium are many and diverse. The principal function for which most auditoriums seem to be designed is to serve as a general assembly place for the entire student body of a school, without much regard as to what will take place once it has been assembled. This practice results in auditoriums that, in large schools at least, are far too huge and barn-like to serve properly for school dramatics. The stage productions in such auditoriums (if, indeed, there happens to be a stage) seem dwarfed, puny, ineffective. If for school assembly purposes the seating capacity of an auditorium must exceed 1,000, it will usually prove unsuitable for dramatics purposes. As a matter of fact, 750 constitutes a better maximum. But if the capacity must exceed 1,000, a large, cheerful assembly hall, simply designed and inexpensively decorated and furnished, should be provided to accommodate large groups; and a separate, more intimate theater auditorium, seating three or four hundred, should be provided for work in dramatics. A separate smaller theater auditorium would be the better plan in any case, even in a small school. And only where the seating capacity can be kept below 1,000 should both functions, those of housing school dramatics and of housing school assemblies, be merged in one auditorium. For an auditorium that requires an assembly capacity of more than 1,000, enough money can be saved by simplification of design, decoration, and furnishings (which would include, besides the seats, only a simple speaker's platform), to cover the cost of a smaller separate theater auditorium with a

completely equipped stage. If there is any thought of providing that most vicious of combinations, namely, gymnasium and auditorium, dramatics should be completely omitted from the school curriculum unless it can be provided with a separate auditorium of its own. The decision as to function and capacity of the auditorium is a basic one, and must be made by the school authorities. After it has been made, and if the auditorium is to house dramatic activities, a number of important factors come up for consideration.

SIZE—SHAPE—SEATING

The first of these is the size and shape of the auditorium and the arrangement of the seats. If seating capacity permits, the seats should be confined to the main floor, and so arranged that all the spectators have a convenient and adequate view of the stage. This requirement of good sight-lines means that the floor should be suitably sloped; that the rows of seats should be suitably spaced (not less than 34 inches apart); that the rows of seats should be suitably curved, so that each spectator naturally faces the center of the stage; and that the ends of rows should not be extended to positions that deprive the spectators in the end seats of a reasonably full and complete view of the stage.

The width of the proscenium opening is very important, both intrinsically and as a basis for most other important dimensions of auditorium and stage. For school dramatics purposes the proscenium width should range between 30 and 35 feet. The tendency in school auditoriums is to provide extremely wide prosceniums, sometimes as wide as 50 feet or more. This is unnecessary for auditorium purposes in general, and is certainly a detriment to dramatics. The height of the proscenium opening should be in suitable proportion to its width, ranging from one-half to two-thirds of the latter, depending to some extent upon the height of the auditorium and its architectural treatment, but preferably nearer the upper limit. The proscenium opening should preferably be a simple, unadorned rectangle.

The width of the auditorium at its widest point (at the back) should approximate not less than one and one-half times nor more than two and one-quarter times the proscenium width. The exact ratio will depend upon seating capacity requirements, but the nearer it is kept to the lower limit, the better will be the sight-lines achieved.

The depth, or the length, of the auditorium should usually be approximately the same as, but never more than one-fourth greater than, its width. If seating capacity requirements seem to dictate a greater depth, recourse must be had to a balcony, but the main floor depth should not exceed the limit given. Beginning at a point about one-third of its depth from the back of the auditorium, the side walls should curve in gracefully until at the front of the auditorium they just blend smoothly into the sides of the proscenium opening, without any break caused by an offset, a molding, or any sort of decorative "picture frame."

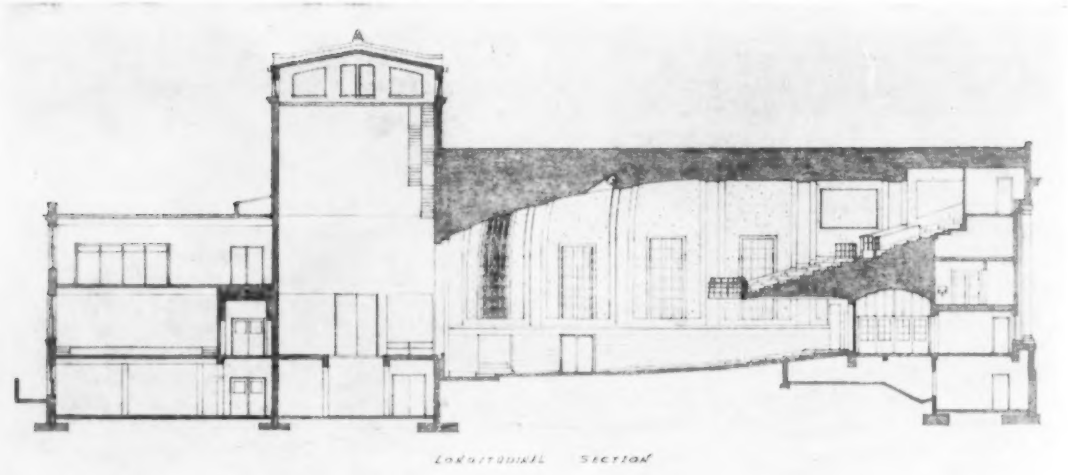
WALLS AND CEILING LIGHTING

In addition to the major features of the auditorium outlined above, which are generally acknowledged as constituting good practice in this field, a number of other features, seemingly minor in nature yet most important to school dramatics work, must be noted. The auditorium, for example, should have no windows, no skylight, no provision of any kind for natural light. It is impossible to produce or rehearse plays effectively in the daytime, during which time most school dramatics work is done, if even a small amount of natural light has access to the auditorium. A completely satisfactory and efficient system of shutters, blinds, or shades has yet to be developed. It is simpler, cheaper, more positive, and more dependable to light the auditorium solely with artificial light.

Walls and ceiling should be decorated in tones that are commonly designated as "high dark" in value; that is, having a coefficient of reflection of approximately 35 per cent. A light-toned auditorium is a distinct detriment to play production. From the standpoint of play production, if from no other, the growing practice of decorating the walls and ceilings of school auditoriums in a harsh, glaring, uncompromising white finish is heartily to be condemned. Because of this desirable low tone of wall and ceiling finish, indirect lighting is hardly to be recommended.

Architectural built-in lighting is suggested if the interior is of a style with which it is compatible; otherwise, regular direct lighting should be used. The actual light sources should be so located and so equipped that they are out of the spectators' range of vision, and that the predominant flux of light is in a vertically downward direction, with all parts of the auditorium adequately covered. In connection with lighting, such auxiliary features as emergency lights, aisle lights, and exit lights require attention. The latter should be of an indirect type, with the light source so shielded that no direct rays of light can escape from the exit lights to spoil dark stage effects.

For properly lighting the stage it is necessary to provide at least three spotlight openings, or "ports," in the ceiling of the auditorium. Each port should be located at such a point that a line connecting it with a point on the stage floor 6 feet back of the act curtain, will form an angle of approximately 45 degrees with the horizontal. One port should be placed opposite the center of the proscenium opening, and the two remaining ports should be placed just opposite, but slightly within, the sides of the proscenium opening. Each port should face down toward the stage, and should not be less than 18 inches high and 5 feet wide. Each port should be provided with facilities for mounting several large spot-



Herbst and Kuenzli, Architects; Theodore Fuchs, Theater and Lighting Consultant

LONGITUDINAL SECTION, SHOREWOOD HIGH SCHOOL AUDITORIUM, SHOREWOOD, WIS.

The Shorewood High School is built on the campus plan, with the various departments and activities housed in separate buildings. The auditorium building, plans of which are shown on these pages, houses the Dramatic Department and the Music Department, and is a good example of the practical application of the principles outlined in the accompanying article. Because the auditorium was planned to house also occasional community activities, its seating capacity is relatively high, being approximately 1,200.

The stage is adequate in size and is completely equipped, both as to the mechanical equipment and as to the lighting and control equipment, with special attention given to the requirements and conditions of school dramatics. Adequate workshops and storage space are provided in close proximity to the stage. The necessary ports for the auditorium beam spotlights are provided at the proper points in the auditorium ceiling, as shown in the above view. The auditorium is without windows or skylights; the panels in the above longitudinal section, which are seemingly windows, are actually indications of the decorative and acoustic treatment of the walls.

The center of the stage is trapped, and the space beneath the stage is used for scene storage. Half of the scene shop is 24 feet high, to accommodate the building and the painting of tall pieces. A well-equipped studio theater is used for classroom work and presentations, and for minor rehearsals. The basement of the building contains also a small cafeteria for the students. Special acoustically-treated band, orchestra, and choir rehearsal rooms and music classrooms are provided on the second floor.

lights behind it, in the attic space above the ceiling, with enough work space behind it to accommodate an operator, and with a safe and convenient means of access. Such ports are of the utmost value as vantage points from which to project light at the proper angle onto the stage, particularly onto the down-stage areas, and should never be omitted. They must be taken into account when the steel structure of the building is being planned, and can easily be incorporated into the architectural treatment of the auditorium ceiling, concealed within false beams, or behind ceiling panels, or within ceiling coves. Although not absolutely essential, supplementary ports for providing light from a 30-degree projection angle are also very useful at times.

OTHER FEATURES

There is usually a possibility of using the school auditorium occasionally for motion pictures, and to this end there should be provided an adequate projection booth at the rear of the auditorium, but not extending out into it. This projection booth need not be fully equipped at first, but certainly provision should be made for the future accommodation of two sound motion-picture projectors, and also two large spotlights powerful enough to reach the stage in a narrow light beam of high intensity. This projection booth involves such features as the necessary fire-shuttered ports, conduits for wiring from the stage, house telephone, signal system, provision for direct current if arc lamps are planned for, film storage, and exhaust vents.

An orchestra pit should be provided, and if the auditorium seats over 500, the pit can be made a bit larger than in the average theater, in order to accommodate the larger orchestras usually found in schools. This can be easily done, since the space ordinarily considered necessary for the stage apron can be used for this purpose. Under no condition should the stage have an apron; the stage should terminate in a straight line at the auditorium side of the proscenium wall, and should not extend out into the auditorium. A stage apron is useless and is a positive detriment to play production work. In the orchestra pit should be a house telephone and signal system, and lighting outlets for the music stands. Incidentally, a light receptacle and a telephone connection jack (leading backstage to the switchboard or stage manager's station) should be installed at an aisle seat near the center of the auditorium, for use by the play director during rehearsals. Provision for the future accommodation of an organ should also receive consideration.

Of course, it is assumed that such standard

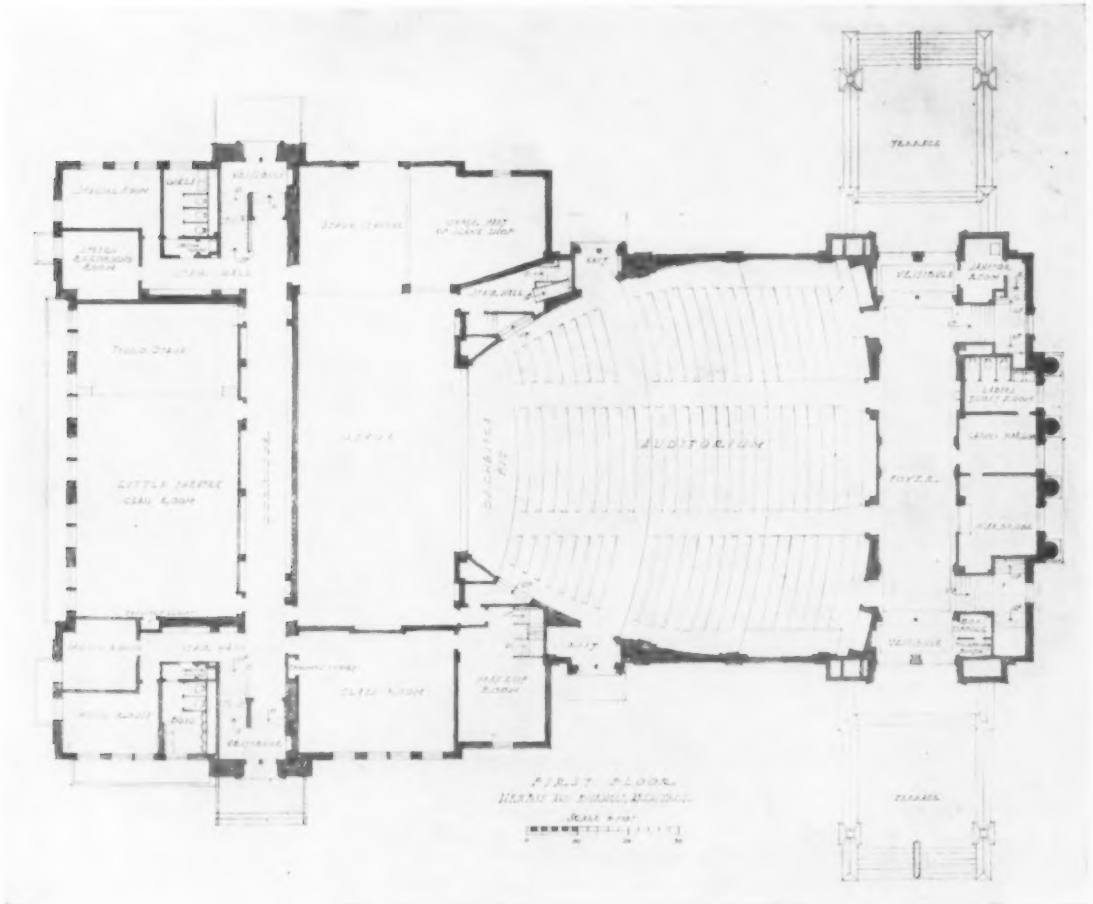
requirements of any auditorium as heating, ventilation, air-conditioning, and acoustics will receive thorough routine attention, as well as all safety code requirements such as seat grouping, aisle-spacing, and exit facilities. In connection with the auditorium, certain external features necessary for the efficient and comfortable reception and handling of a body of spectators, such as are taken for granted in even the smallest commercial playhouse, should not be overlooked just because the auditorium happens to be the adjunct of an educational institution. A checklist of such items would include vehicle driveway and parking spaces, entrance, lobby, box office, foyer, check-room, public telephone, lounges, smoking room, refrigerated drinking water, rest rooms, and toilets. Such items should receive particular attention if, as is often the case, it is planned to rent the auditorium, or to use it for community purposes in addition to regular school purposes.

The Stage

The term "stage" as here used includes not only the actual "acting area" in which the presentation of a play takes place and which is visible to the audience, but also all areas and spaces adjacent to this acting area that are directly associated with, and absolutely essential to, the process or mechanics of play presentation. Far too often in school architecture has the term "stage" been considered as synonymous with the term "acting area," and a little walled-in, box-like cubicle provided that decisively thwarts all effective and serious work in dramatics. The area of a stage floor must include not only the actual acting-area space, but approximately five or six times as much floor space as this, in the form of "backstage" areas, in addition!

SIZE—SHAPE

The entire stage should be behind the proscenium; as explained previously, no part of it in the form of an apron should extend out into the auditorium. Nor should there be any permanent steps leading down from the stage into the auditorium. The depth and width of the stage should be as great as is reasonably possible, but under no conditions should the depth of the



MAIN FLOOR PLAN, SHOREWOOD HIGH SCHOOL AUDITORIUM

stage be less than the proscenium width, nor the width of the stage be less than twice the proscenium width. This excess of stage width over proscenium width should be so proportioned on each side of the stage that the "off-stage" space (beyond the side of the proscenium) on each side is never less than half the proscenium width. The height of the stage space, measured from the floor to the gridiron, should be approximately three times the proscenium height, but never less than 50 feet. These dimensions for the stage space apply to space that is absolutely clear and unencumbered.

FLOOR—WALLS—ACCESS

The stage floor should invariably be level; it should never be inclined. For good visual conditions in the average auditorium, the stage floor should be approximately 3 or 4 feet higher than the auditorium floor level at the front row of seats.

It should be covered with a double thickness of pine or fir flooring, the top layer being of close-grained, high-quality stock, in order to receive easily the coarse-threaded stage screws used for bracing scenery. The possible exception to this is the downstage, or front, section approximately 8 feet deep and equal to the proscenium opening in width, which may be finished in maple or other hardwood. Immediately upstage of this, an area about 10 feet deep, and within the side proscenium limits, may be trapped in small, easily-handled sections. This, however, is not an absolutely necessary requirement, unless the space beneath the stage is used for storage of scenery.

The back wall of the stage should be kept absolutely flat over its entire surface, unpierced with openings, and free of piping or other encumbrances. When finished in a rough, sand-floated white cement plaster which has been carefully applied so as to provide an absolutely plane vertical surface, it will lend itself admirably to effective lighting and thus serve as a permanent sky-cyclorama background. The plaster should be applied over the extreme width of the back wall, and as high up as would be required by a reasonably extreme vertical sight-line from the auditorium, or about twice the height of the proscenium opening. It is wasteful to apply the plaster any higher than this. The stage should be considered distinctly as a utilitarian work space, as, for example, the fan room in the attic; structural details should be left exposed, and not a nickel spent on plaster, trim, or decorating (except for the plaster sky-cyclorama, of course). There should be no windows, or translucent skylights, on the stage.

Access to the stage should be provided in each of the side walls. On the stage-right side ("stage right" and "stage left" are determined by facing the auditorium) should be a 5- by 7-foot double door, and on the stage-left side should be a large double door or opening not less than 8 feet wide and 12 feet high. From this large doorway an access passage of similar cross-section, unrestricted by sharp bends or encumbrances, should lead to the scene construction shop and other workshops and to an outside loading platform that is reached by a suitable driveway. Passages, corridors, and doorways immediately adjacent to the stage should be arranged so that the stage can be shut off and isolated in privacy from other parts of the building, particularly from those parts that are public in character or that are likely to be a source of noise and commotion, and so that convenient "cross-overs" during full stage scenes may be made by actors from one side of the stage to the other.

MECHANICAL EQUIPMENT

A well-equipped gridiron and counterweight system is necessary for suspending and operating the fire curtain, act curtain, teaser, tormentors, drapes, travelers, borders, cloth cycloramas, motion-picture screen, lighting equipment, scenery, and so forth, and is quite indispensable. The gridiron should be incorporated in the steel structure of the building. A gridiron with three sheave-wells, providing for three-line suspension, is adequate for a stage having a proscenium width less than 45 feet, and hence would be ample for the size of stage under consideration here. The center sheave-well should correspond with the stage center axis, and the side sheave-wells should be located not farther than 15 feet from the center, but never less than 2 feet within the proscenium sides. The sets of lines on the gridiron should be equal in number to at least the number of feet of stage depth. The lines should be of flexible steel, and each set should be equipped with a permanent steel pipe batten several feet longer than the proscenium width. A standard counterweight system, with endless hand-lines and locking-rail, should be provided at the stage-right wall of the stage. The conventional practice is to mount the counterweight system directly against the side wall, the operator then facing off-stage. A useful variation of this practice (especially for school use) is to reverse the counterweight system and install it about 2 feet away from the wall, in such manner that the operator faces on-stage and hence can see directly what he is raising and lowering on the stage.

From the standpoint of safety in school use, the counterweight system, except for an operating space, should be enclosed in a heavy wire mesh cage, the on-stage side of which is 18 feet high, and the off-stage side (only in a reverse system, of course), about 8 feet high. This cage should be strong and well braced, so that flats and other units of scenery can be stacked against it. A counterweight loading platform should be provided about 6 feet beneath the gridiron, to assure a safe vantage point for changing and adjusting counterweights. Both the loading platform and the gridiron should be provided with a safe, convenient means of access. Headroom of 6 feet should be provided between the gridiron and the roof of the "stage-house." This roof should be

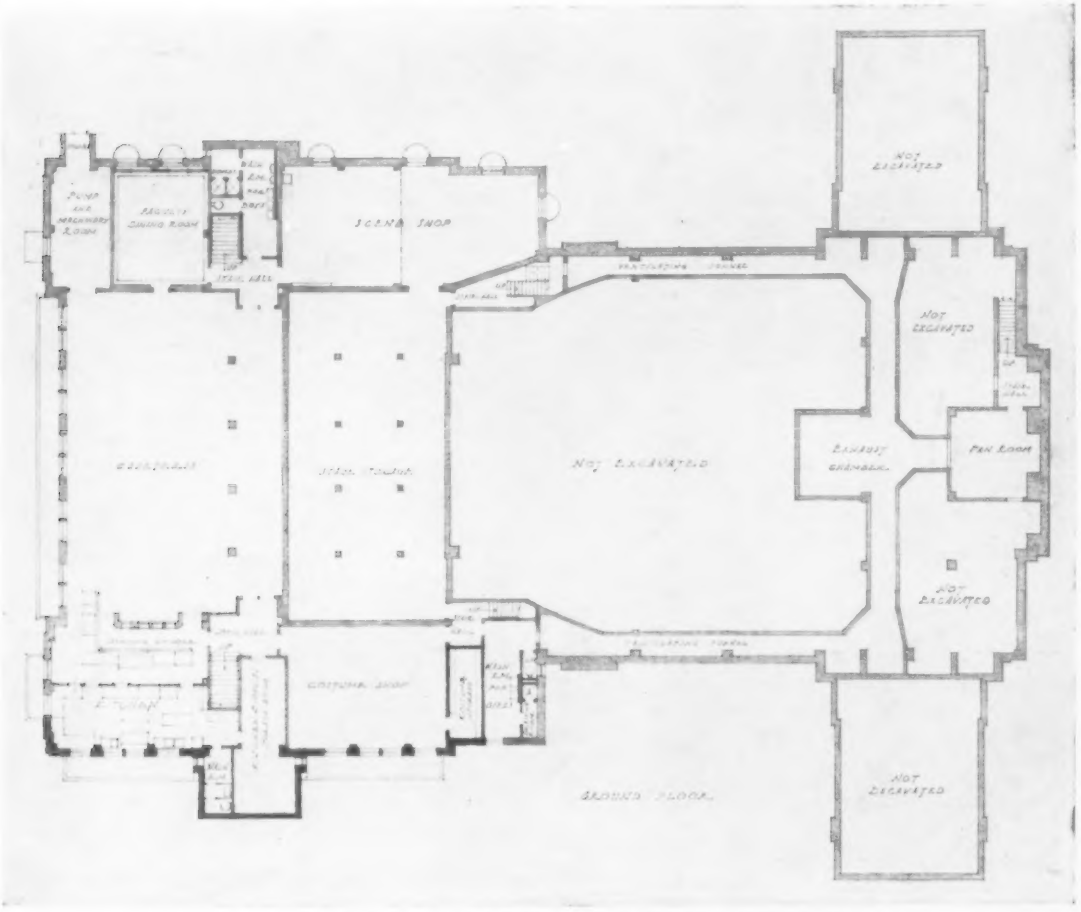
pierced with an automatic fire-control ventilator of adequate size and approved design. Hose-reels, standpipes, and sprinklers should be provided on the stage as a matter of course.

CURTAINS—DRAPES

The gridiron provides the means of suspending and operating certain important permanent units of equipment. The first of these is the fire curtain, which, sliding vertically in "smoke pockets" at each inner side of the proscenium, can effectively seal the proscenium opening with a fire-resistant barrier. The fire curtain may be of steel or asbestos, depending upon local fire regulations. It is ordinarily operated at will, but should be so equipped with auxiliary counterweights and fusible links that it will descend slowly of its own accord in the event of fire. The second set of lines from the gridiron will accommodate the act curtain. This may be of the vertical sliding type, but perhaps a better and more pleasing type for school use is the draw curtain, operating in a pair of tracks, or "travelers," that are suspended from the gridiron at a permanent height.

Next upstage of this is the cloth "teaser" of ample height, which serves as the adjustable upper limiting valance for the proscenium opening. An ornate permanent valance, or "grand drape," hung on the auditorium side of the fire curtain, should be avoided. Next should come a pair of side "tormentors" operating on travelers, which serve as the adjustable side limiting maskings for the proscenium opening. The teasers and tormentors together are as necessary as the act curtain, because they provide the important means of adjusting the actual opening at the proscenium to various sizes and types of stage settings. The next set of lines upstage of the tormentors should be reserved for a scrim, or gauze, drop. On the next set of lines should be mounted the teaser light batten, and on the next, the first borderlight. Or both of these sets of lines may be coupled together, and operated as a unit to accommodate a "light bridge."

On other upstage lines should be provided sets of drapes, which are practically invaluable for



GROUND FLOOR PLAN, SHOREWOOD HIGH SCHOOL AUDITORIUM

school purposes. This equipment should not be too permanently attached to the gridiron lines, but should be capable of being changed and readjusted to suit special purposes. A practicable set of stage drapes would include main and auxiliary cloth cycloramas, several sets of draw curtains (or "close-in" curtains), and masking borders. The main cloth cyclorama, of black velour, would consist of three sections, each virtually a separate pair of draw curtains operating on a pair of travelers; the back set, on a set of lines about 6 feet downstage of the back wall of the stage, and two side-arm sets, which hang up- and downstage, filling in almost the whole distance from the back wall to the front wall of the stage. The main cyclorama drapes should be about one and one-half times as high as the proscenium height. The travelers of the back set should be masked by an adjustable cloth border of ample height, and those of the side-arm sets should be capable of being moved on- and off-stage so that they can be set at any desired angle, or drawn offstage to clear battens that are lowered within the main cyclorama. About 6 or 7 feet downstage of the back set of main cloth cyclorama draw curtains should be another set, not quite as high, of black velour draw curtains on a pair of travelers, similarly masked by an adjustable cloth border. Six or seven feet downstage of this should be the back set of draw curtains of an auxiliary, or inner, cloth cyclorama, which might well be of silver-gray velour, and which should have side-arm sets similar to, but simpler than, those of the main cyclorama. Six or seven feet downstage of the back set of auxiliary cloth cyclorama draw curtains should be a fourth set of velour draw curtains, either gray or black, or better still, double-reversible, the travelers of which are masked by an adjustable cloth border of matching material. The spacing dimensions given above should be so adjusted that this last-mentioned set of draw curtains (often referred to as the "olio close-in curtains") is spaced about 4 or 5 feet upstage of the main act curtain.

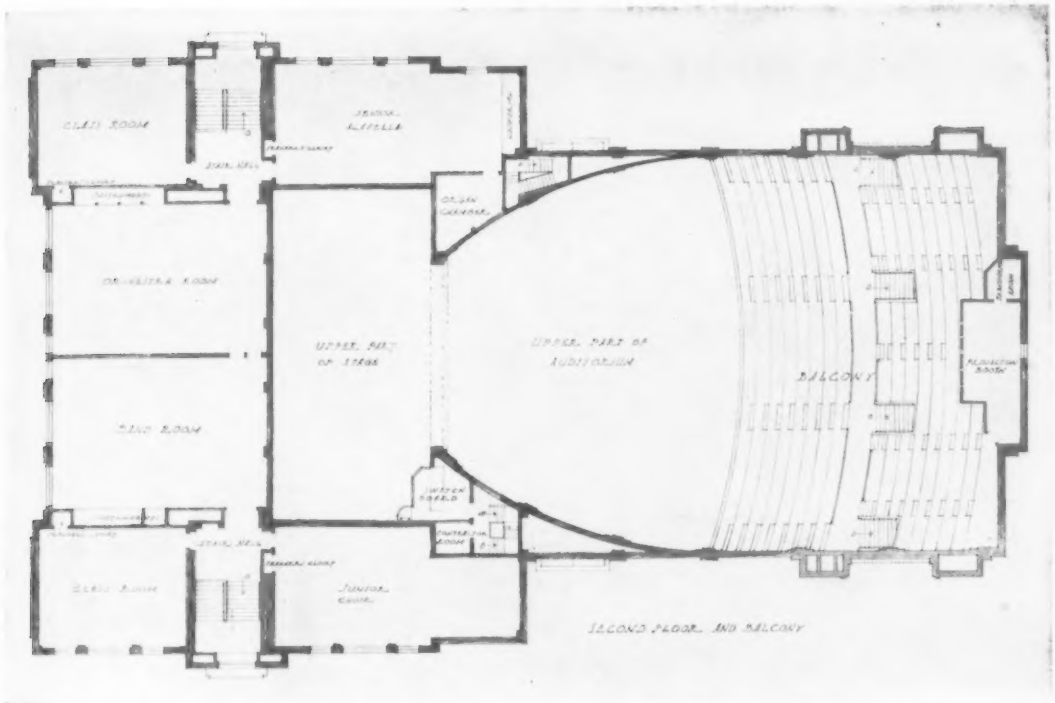
Such a set of drapes as have been outlined here will satisfactorily accommodate almost any reasonable non-dramatic use to which a school stage will be put, and yet they are equally serviceable for play-production activities. Of course, for the purposes of the latter, the ideal method would be to have a complete supply of drapes of various colors and sizes, and six or eight pairs of travelers, which could be set up in exactly the proper arrangement desired for any particular occasion or use. But this is not usually practicable on a school stage, unless the stage is used solely for dramatics, or unless adequate labor is available for making the constant changes required by the demands of varying occasions.

LIGHTING EQUIPMENT

The one remaining essential feature of the stage which requires consideration is the lighting equipment. The conventional arrangement of footlights and borderlights, by itself, is definitely obsolete, unsuitable, and inadequate for present-day play production activities. The spotlight, offering infinitely greater possibilities for lighting control, is the basis of effective modern lighting. Spotlights are applied most advantageously from the ceiling spotlight ports in the auditorium, and from the teaser light batten, or the light bridge, on stage, though their effective use is by no means restricted to these locations. Vertical pipe battens behind the tormentors, suspended borderlight battens upstage of the teaser light batten, pedestals and portable light towers on the stage floor—all these are important vantage points for spotlight projection. The outstanding feature of a set of lighting equipment should be flexibility, both mechanical and electrical. Flexibility makes it possible for lighting to be subtly "tailored," or "fitted," to each play and each scene—something that is virtually impossible with the old rigid set-up of footlights and borderlights. However, unless the stage is to be used solely for dramatic production work, borderlights should also be provided, for they furnish a convenient means of simply "turning on lights" for such occasions as lectures, recitals, and concerts, which do not require any real stage lighting.

It is not possible to specify a general layout of lighting equipment that would prove satisfactory for all cases, but attention can be called to certain items that require consideration. The older functions of footlights have been mostly taken over by the spotlights in the auditorium ceiling. These should be of standard large size, and not less than two for each of the three ports should be provided. Also, for non-dramatic use of the stage, one concentrating floodlight in each port is desirable, focused onto the stage, or for some occasions, onto the orchestra pit. But footlights still have a distinct field of usefulness, and should not be omitted. They must be very carefully designed, and should preferably be of the indirect type, and should be wired for proper control in three section circuits and three color circuits.

On the teaser light batten should be mounted twelve to sixteen small "baby" spotlights for acting area lighting, and two to four large floodlights for tonal lighting. On the first borderlight batten, immediately upstage of the teaser light batten, should be an individual-reflector type distributive borderlight wired for control in three section circuits and three color circuits. Four to six additional circuits with receptacles should also be available on the borderlight batten for plugging in spotlights or other equipment for special needs. Under some conditions it is possible and desirable to combine the teaser lights and the first borderlights in a single unit called a "light bridge." This enables an operator to reach the lighting equipment conveniently and make changes between or even during scenes. Two additional borderlights, similar to the first, except that their



SECOND FLOOR AND BALCONY PLAN, SHOREWOOD HIGH SCHOOL AUDITORIUM

light output should be essentially concentrating rather than distributive in character, should be provided, one immediately upstage of the back set of draw curtains of the inner cloth cyclorama, and the other immediately upstage of the separate set of black velour draw curtains.

Immediately upstage of the back set of draw curtains of the main cloth cyclorama should be provided a powerful borderlight unit with well-designed reflectors that will provide a smooth sheet of light for lighting the plaster sky-cyclorama. This unit should have three section circuits and three color circuits and special plugging receptacles just as have the downstage borderlights. About four "baby" spotlights should be mounted on a vertical pipe batten behind each tormentor, preferably with the batten moving on- and off-stage with the tormentor itself. Six floor pockets, each containing three separate circuits of plugging receptacles for portable lighting equipment, should be mounted in the stage floor, three on each side of the acting area.

In addition to the equipment mentioned above, an adequate amount of portable equipment and connecting cables should be provided. This would include large and small spotlights, floodlights, long and short striplights, projectors, and so forth. But it is most important that all the lighting equipment on the stage be completely flexible and interchangeable as to details of both electrical connection and mechanical mounting. Worklights for the stage are most conveniently incorporated, as separate circuits, with the cyclorama lights and each of the borderlights.

THE SWITCHBOARD

The switchboard for controlling the lighting equipment requires special attention. Here again flexibility should be the dominant feature. It is a fact that most switchboards ordinarily supplied for school auditoriums (as well as the lighting equipment that they control) are utterly unsuited to the needs of school dramatics by virtue of the inherent nature of their design. Novel features and "gadgets," such as elaborate provisions for "pre-setting," are useless and expensive, and should be avoided. A switchboard should have ample capacity, both as to the number of control circuits and as to the individual capacity of each and the total capacity required by all. For an average-size stage the total capacity should range between 75 and 100 kilowatts; the number of control circuits should range between 35 and 50; and the number of equipment circuits (which extend from the switchboard to the units of lighting equipment on the stage) should range between 100 and 150. The control circuits on the switchboard should each have a switch, a dimmer, a fuse, a pilot light, and a group of plugging receptacles, and should be capable of being suitably grouped, or "mastered," for control.

In order to observe the cardinal principle of flexibility, the equipment circuits should not be

connected permanently to control circuits. Instead, they should terminate at the switchboard in plugging cords, so that they may be interplugged and interconnected at will with the proper control circuits in order to achieve a control set-up that will meet the highly individual control requirements of each play, or scene. This arrangement allows of far more efficient control possibilities than does a permanently connected switchboard used with a conventional system of footlights and borderlights. And as to actual results achieved, there is no comparison between the crude, blatant, vaudeville type of lighting provided by the latter outmoded system, and the subtle, smooth, graded, mobile effects possible with the system here recommended.

The switchboard should be positioned so that the operator has a reasonable chance of viewing the acting area. This is always difficult to achieve unless the switchboard is placed at some vantage point in the auditorium. For school purposes, however, perhaps the best location is the conventional one, namely, recessed in the front wall of the stage, just to right-stage of the proscenium, on the stage floor level. This position is traditionally the stage manager's station and is the center of activities during performance. At this station there should be a house telephone and signal system to offices, projection booth, box office, orchestra, dressing-rooms, and so forth.

The Workshops

The third group of physical facilities necessary for school dramatics includes the workshops—the spaces in which the actual work of preparation for dramatic production is carried out. These are almost equal in importance to the auditorium and the stage, though this importance is rarely adequately recognized, either as to the amount of space allotted or as to the equipment which it contains. As in the case of the stage, these spaces are purely utilitarian and should be wholly functional in character. Money which would otherwise be wasted on decorative elements should be applied to the necessary equipment. The workshops must house such activities as construction, painting, and storage of scenery and properties; cutting, dying, sewing, and storage of costumes; maintenance and storage of lighting equipment; make-up and dressing for performances; studio performances, and tryouts and rehearsals.

The construction and painting of scenery and properties, and the storage of scenery, can, at least for school purposes, be grouped in a single space with a floor area of from 1,500 to 2,500 square feet, at least half of which has a height of about 20 feet to accommodate the painting and storage of scenery flats. It should be equipped with a scene dock, lumber rack, tool cage, paint frame, large sink, gas plate, band saw, table saw, electrical drill, supply shelves, cupboards, and so forth. Properties, including furniture, are best stored separately, a floor space of from 250 to 500 square feet, with ample shelving, being adequate. It is important that these two spaces be as close as possible to the stage, and connected with it by a passage of ample dimensions as mentioned previously.

Costume activities are best concentrated in one space, except perhaps that costume storage may be set apart by itself, if necessary. The costume space should range in floor area from 750 to 1,000 square feet. It should be equipped with 6-foot-high wardrobes running the length of two walls, shelves above the wardrobes for storage of fiber costume boxes, supply shelves, cutting tables, sewing machines, ironing boards, gas plate, and a large sink or washtub. A space of from 100 to 200 square feet floor area, equipped with a workbench and appropriate storage shelves, cabinets, and racks for portable equipment, supplies, and tools, should be provided for maintenance and storage of lighting equipment. One requirement that these work spaces have in common is good, plentiful, utilitarian lighting, and an abundant supply of electrical receptacles of adequate capacity, located in the right places.

From four to eight dressing-rooms, each large enough to accommodate two or three persons, should be provided. Each should be equipped with costume racks, make-up tables, mirrors, lights, and lavatories, and should be convenient to shower and toilet facilities. Instead of a number of smaller dressing-rooms, another plan, which is particularly suitable to school dramatics, may be employed. This is to provide two large dressing-rooms, each equipped with benches, costume racks, lockers, and washing, shower, and toilet facilities, and to have these open onto a common large make-up room which can also serve as a sort of green-room during performances. The make-up room should have simple make-up tables, mirrors, and lights, to accommodate about twenty persons. It can then also be used for classes in make-up. Dressing rooms should, of course, be in close proximity to the stage, but should never open directly onto it.

If the stage is not used exclusively for dramatic work, a special dramatics classroom of about 2,000 square feet floor area should be provided, with a simple platform stage at one end. This can then be used for classroom and studio exercises, and for tryouts and preliminary rehearsals when the main stage is otherwise occupied.

All the suggestions and recommendations included in this discussion are simple, basic, elemental, and practicable; and all are based on requirements that are necessary and vital to successful modern curricular school dramatics. They do not include frills or unnecessary items of any sort; they are not over-stated, nor are any of the requirements exaggerated; they are not theoretical or experimental or visionary in nature; and all of them have been included in actual installations throughout the country and have unquestionably proved their worth and practicability from educational, artistic, and economic viewpoints.

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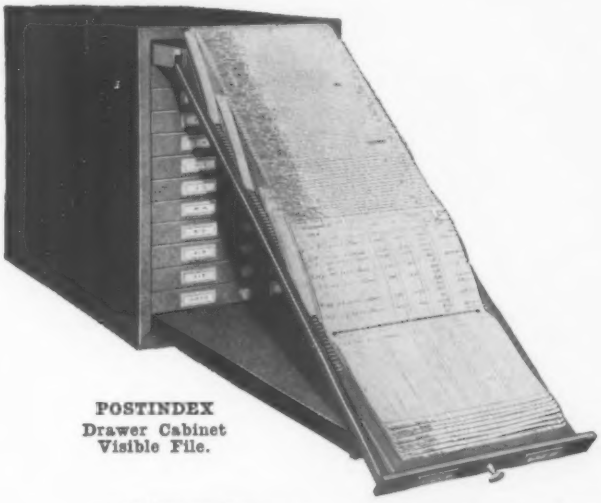

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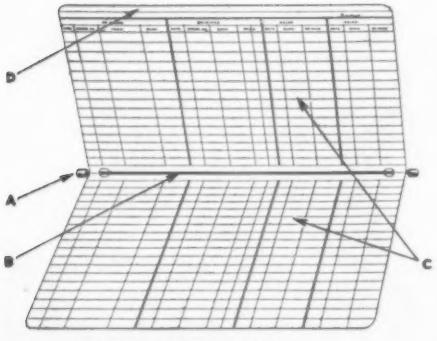

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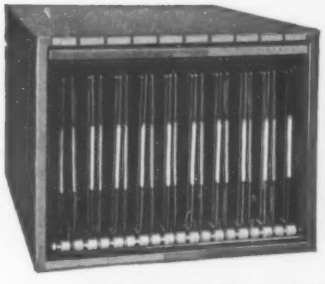

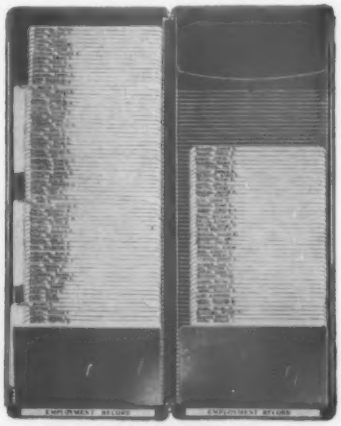

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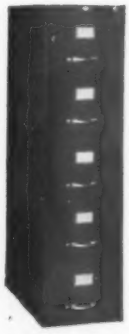

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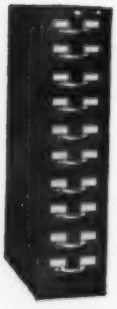

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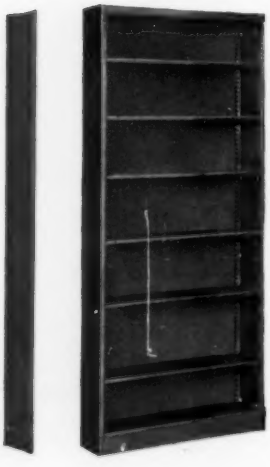

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Art Metal Lockers are built on the unit principle, each locker having its own welded front frame and door of 16 gauge, best furniture grade steel. They have the durability to maintain good appearance under hard usage. When recessed into walls full service may be expected for the lifetime of the building in which they are installed. Any number of lockers may be grouped side by side or back to back. Malleable iron legs with adjustable footings, or continuous base. Finishes: S-F Brown; Olive F; French Gray.

Type S Single-Tier Lockers—Twenty-one sizes. Standard equipment includes hat shelf with rolled front edge, three nickel-plated wall hooks and one shelf hook.

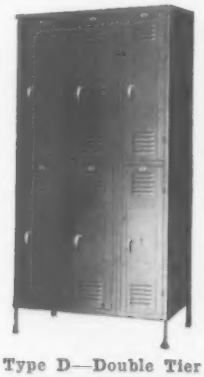
Type D Double-Tier Lockers. Eleven sizes. These lockers are used for school gymnasia.

Type 2-G Gym Suit Lockers—With this combination all of the gym-suit locker users use the single-tier locker for street clothing. Any ratio of gym-suit lockers to single-tier lockers may be arranged.

Type B Compartment Lockers—These lockers may be had five or six tiers high in the 12-inch height; four tiers high in the 15-inch height and five tiers high in the 14⅖-inch height.

Send for Catalog showing complete line of Art Metal School Lockers

Type S—Single Tier



Type D—Double Tier

Type 2-G Gym Suit

Type B Lockers

THE BERGER MANUFACTURING CO.

Division of Republic Steel Corporation

Canton, Ohio

Two-Person Lockers

BERLOY STEEL EQUIPMENT is manufactured by an organization that **knows** the needs of the modern school and university. Built to meet the most rigid requirements for durability, utility, and structural perfection Berloy Steel Lockers, Cabinets, and Shelving nevertheless can be purchased at prices quoted for the commonplace.

Berloy Steel Equipment possesses unusual beauty of design and finish. All items are quickly available in practically every size and type. Experienced Berloy Engineers will be sent anywhere to assist architects, builders, or purchasing agents in the planning of new installations.

Berger's 50-year reputation for highest quality goods, square dealing, and fair prices insures complete satisfaction.

Filing Cabinets

Teachers' Combination Cabinet

B BERLOY

"First in Locker Values"

Book Shelving

Students' Corridor Single Tier Lockers

Teachers' Combination Wardrobe Lockers

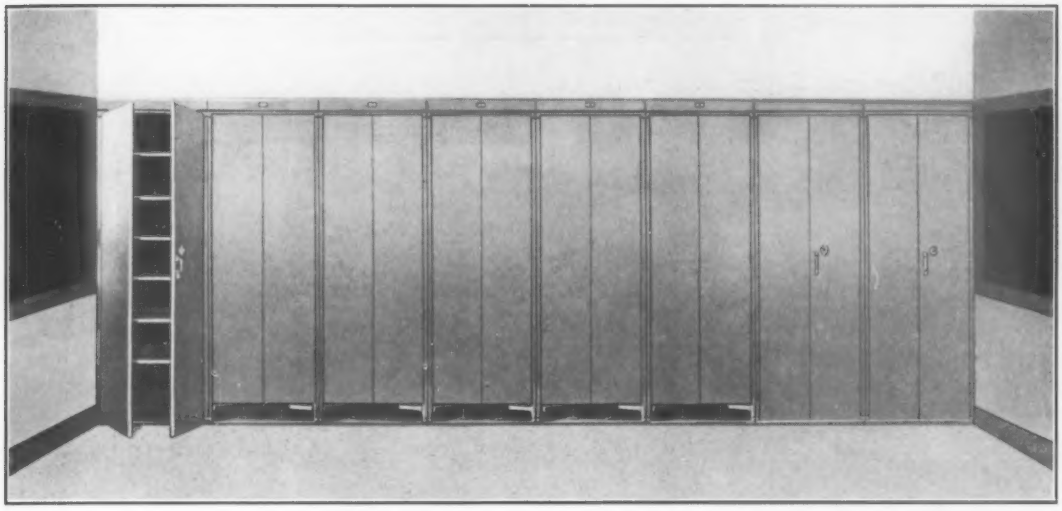
Students' Gymnasium Compartment Lockers

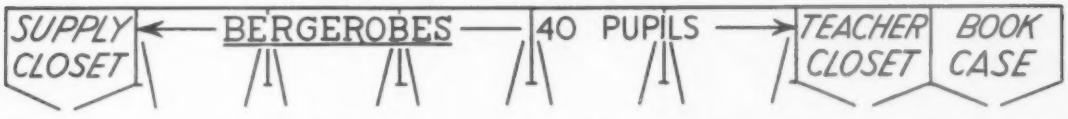
Students' Gymnasium Double Tier Lockers

THE BERGER MANUFACTURING CO.

DIVISION OF REPUBLIC STEEL CORPORATION

Canton, Ohio





BERGEROBES *Provide a Modern Method for Safeguarding Children's Apparel*

Doors Closed

A Bergerobe class room installation provides selected and allotted facilities within each class room, consisting of clothing accommodations for pupils, supply storage space, teacher's personal accommodations and adequate space for necessary books.

Five Bergerobes will accommodate 40 pupils and a Bergerobe supply closet, teacher's closet and bookcase completes the requirements of each room.

Each Bergerobe consists of a metal unit 26″ wide equipped with two receding type doors. The floor, walls and ceiling are of steel. Door operating hardware is ball bearing, non-projecting, mounted to the side frames of the unit, thus eliminating all hardware from the floor. No hardware on the floor precludes tripping of pupils and the floors may be swept clean without inconvenience. The recognized standard method of ventilation is maintained with Bergerobes.

Shelves are adjustable, thus providing for shelf height changes at any and all times. Double prong type hooks with numbers are provided.

The projection of the doors as they are operated is only 1″ into the aisles. Thus, the greatest freedom of aisle space is obtainable with a Bergerobe installation.

Bergerobes are multiple operated, multiple locked when open and multiple locked when closed. Write for catalog and complete information.

Doors Open

BERGEROBES — The Modern, Economical School Wardrobe

S. H. COUCH COMPANY, INC.

Centralized Sound, Telephones, Fire Alarms and Program Signaling

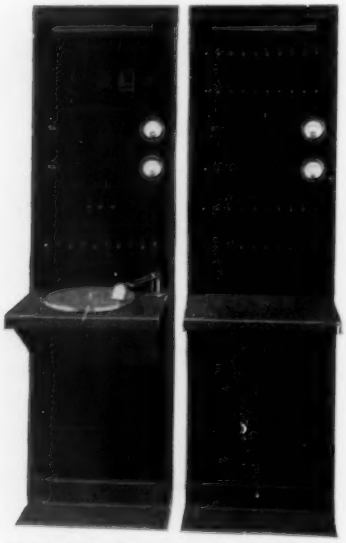
North Quincy, Mass.

"Unified" Sound, Telephone and Signal Systems

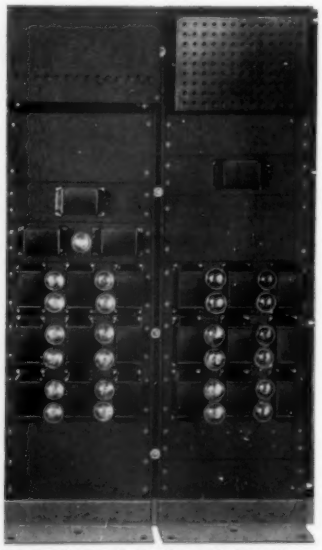
The unification of radio, telephone, program signaling and in some cases fire alarm signal systems, offers very definite advantages and economies which school boards, architects and building committees are quick to realize. Radio programs, time signals, fire alarm signals and complete telephone service—all can be operated over a three-wire circuit with tremendous economies in apparatus, conduits, wire, labor and maintenance, when compared with the older installations where each system is a separate entity.

The unified switchboard illustrated at the right provides telephone and sound system control for a school with fifty outlying telephones and speakers. This type of switchboard is recommended for any size system, but in the larger systems it is usually desirable to mount most of the amplifier equipment on a separate rack and panel assembly with remote control at the switchboard.

"Unified" Switchboard for school of 40 classrooms



Typical Rack and Panel assembly for school of about 40 classrooms. Note phonograph turntable and table for handling records



Rear view of Rack and Panel assembly showing enclosed radio tuner and monitor speaker and the neat and efficient method of mounting amplifiers and other units

Centralized Sound Systems

Rack and Panel construction of central equipment allows extreme flexibility and ease of inspection and is definitely recommended for the larger installations. The design and construction of Couch equipment is the result of many years of specialized experience in this field.

Any centralized sound system with a turntable mechanism may, if specified, be equipped with electrical recording facilities—a most desirable adjunct to the teaching of elocution, public speaking, etc.

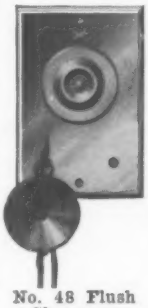
Write for Bulletin No. 97

A Telephone System Saves Time and Footsteps

The three school telephone systems listed below cover the requirements of the large majority of schools.

Lamp Switchboard System No. 351 (selective ringing, selective talking) is recommended for schools having any number of substations from 40 or 50 up. Cross-connection between substations is provided by cross-connecting cord pairs at the switchboard. Standard equipment includes a lamp and jack for each line, operator's ringing and listening keys, power switch, night bell, and a silencing switch and operator's talking set which may be either breast-type transmitter and head set or suspended or cradle hand set. Cabinet work is of finest design and construction, and best quality materials used throughout. A selection of switchboards in wall, floor or desk types is available.

No. 49 Surface Classroom Phone



No. 48 Flush Classroom Phone

No. 71 Handset Classroom or Office Phone

Master Station Systems Nos. B3B and B33B (selective ringing, common talking) are recommended for grade schools of any size up to 30 to 40 rooms. Communication is provided between master station and substations. Intercommunication between substations may be obtained by calling the master station. System B33B differs from B3B in that it has an annunciator which gives visual indication of the origin of each call at the master phone.

No. 52 Flush Handset Phone

No. 53 Surface Handset Phone

No. 8A Desk Type Lamp Switchboard

Classroom Phones: The telephones illustrated are for use on the systems described on this page, also for the UNIFIED Systems mentioned on p. 282, equipped with or without button according to requirements of system. The phones are the result of many years manufacturing experience and represent a distinct advance in design and quality.

Flush Break-Glass Fire Alarm Box

Every School Should Be Equipped with a Fire Alarm

S. H. Couch Company, Inc., offers apparatus for school fire alarm systems ranging from the simplest open circuit continuous ringing systems to the more elaborate closed circuit, double supervised, coded, pre-signal and city-connected systems. Complete catalog information is available and specifications will be prepared for architects and others interested.

Fire Alarm Systems may be specified with the conventional single stroke or vibrating gongs for fire signals, or the fire signals may be sounded through the loud speakers, thus eliminating the gongs and attendant wires, conduits, etc. In the latter case, a fire signal takes precedence on the system by automatically cutting out any and all programs that may be in progress. While the sounding of fire signals over the sound system is approved by the National Fire Prevention Association, a separate and distinct system of wiring and conduit for the fire alarm box circuits is required.

Break-Glass Pull Lever Fire Alarm Box

Underdome Type Fire Alarm Gong

Master Station for System B3B

Horns may be used in place of, or with gongs on Fire Alarm Systems.

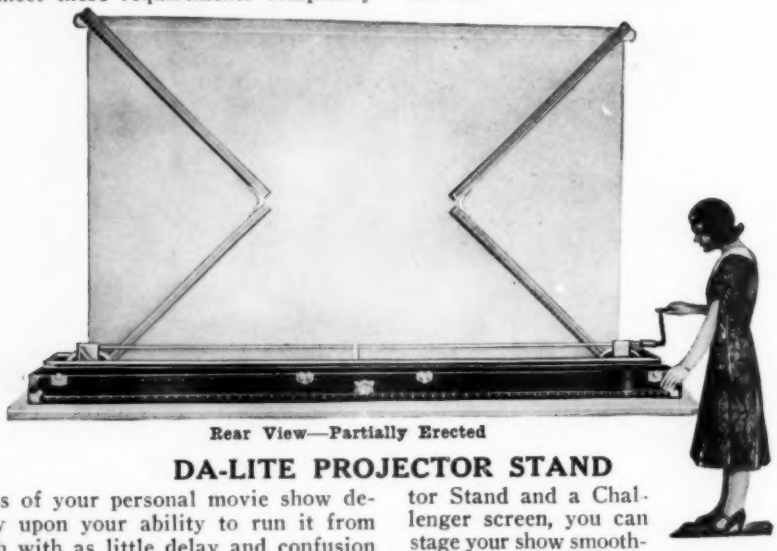
Write for Bulletin No. 97

DA-LITE SCREEN COMPANY, INC.

2723 North Crawford Ave.
Chicago, Illinois

DA-LITE MASTER

Locations do not always permit an installation of a screen on the wall or ceiling. Many schools, clubs, churches, etc., require large screens that are portable and easily installed. The Master is designed to meet these requirements completely —The screen, which is mounted in a re-enforced case can be cranked up or down in a few seconds. Perfect control and safety is provided. This screen will give theatre efficiency and years of service.



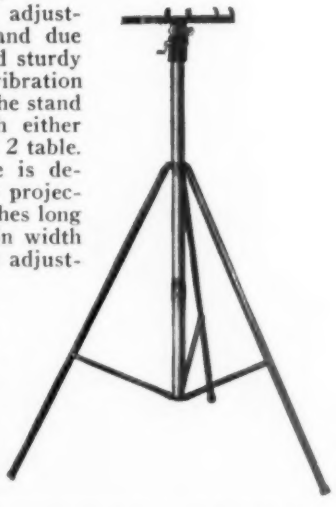
Rear View—Partially Erected

DA-LITE PROJECTOR STAND

The success of your personal movie show depends largely upon your ability to run it from start to finish with as little delay and confusion as possible. That requires careful preparation and proper equipment. The placing of the audience with a view to their maximum comfort and pleasure is very important. The best seats, as in the theatre, will be directly in front of the screen. With an improvised stand or table it is often difficult to elevate the projector enough to throw the picture over the heads of those occupying the choicest seats. With a DA-LITE Projector Stand and a Challenger screen, you can stage your show smoothly and efficiently.

Model F—Front View

The F is a table model. The screen fabric is mounted in a metal case equipped with a center support and adjustable feet. This is a popular low priced model.



This stand is adjustable in height and due to its re-enforced sturdy construction all vibration is eliminated. The stand is equipped with either the No. 1 or No. 2 table. The No. 1 table is designed for silent projectors. It is 12 inches long and five inches in width with side clamps adjustable to eight inches. This table is tilted by means of a crank. It can be clamped solid or rotated as desired. Table No. 2 is 12 inches by 20 inches (non-tilting) and will accommodate sound and slide projectors. This complete unit is finished with baked black crystal and chromium. Stand can be wired with projector cord by removing plug cap and threading tubular member from lower end through the outlet at the top. It is light in weight and folds compactly.

CHALLENGER

The Challenger type is made in the Standard and De Luxe models. The Standard model made in three sizes as follows, 30″ x 40″, 36″ x 48″, and 39″ x 52″. It is adjustable in height. The De Luxe is made in widths ranging from 60 inches up to 94 inches inclusive—This model due to its size is operated by means of a crank. Both models have ample height to permit projecting the light over the heads of the audience. The screen and tripod are combined into one compact unit that sets on the floor. The Challenger equipped with the DA-LITE beaded screen surface will give you brilliance and detail in your picture, as you want it. It also saves time and confusion in staging the show.

NEW DEAL

This is more than just another box screen. It is decidedly different. The whole unit is smaller, lighter and more compact. The color is snappy, yet pleasing. Only the highest grade screen material goes into the NEW DEAL.

SINGLE COLLAPSIBLE SUPPORT

This feature is found only in our NEW DEAL and MODEL F construction. It consists of a hinged collapsible support attached to the rear center of the box. This support is extended to its full operative position by releasing the spring lock. This lock automatically catches again at the exact height required. When the screen is hooked over the goose neck at top of extension, its alignment will be found to be perfect—no wrinkles—no twisting. If you want a medium priced box screen with both pleasing appearance and quality in abundance, you should see this model before you buy.

YOUR SCREEN IS IMPORTANT

Regardless of how efficient your camera and projector may be or how finely produced and processed the motion picture you are showing, you cannot get full value therefrom if you use an inferior screen that reflects only a small portion of the projected light.

The Da-Lite beaded screens bring new sharpness, depth and brilliance to motion pictures.

CRAFTSMANSHIP

For twenty-six years Da-Lite Screens have been extensively used in the Amusement, Educational, Industrial and Amateur fields. Experienced craftsmen have consistently improved their reflective properties, design and mechanical function until today the Da-Lite line is most complete and meets fully every projection requirement—Comparison is invited.

See your dealer or write direct for full information.

THE GENERAL FIREPROOFING CO.

Youngstown, Ohio

BRANCHES

BOSTON—74 Franklin Street
CHICAGO—36 S. State Street
CLEVELAND—1235-37 Prospect Street
HARTFORD—8 Ford Street
LOS ANGELES—1733-35 So. Los Angeles Street
MINNEAPOLIS—310 N. First Street
NEWARK—17 Academy Street
NEW YORK—500 Fifth Avenue
PHILADELPHIA—2301 Chestnut Street
PITTSBURGH—642 Grant Street
ST. LOUIS—610 Arcade Building
SAN FRANCISCO—534 Fourth Street
WASHINGTON—201 Mills Building

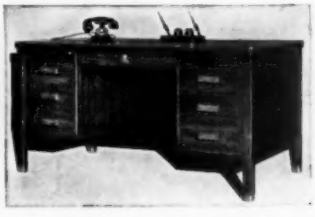
Dealers Elsewhere. Write for Name of One Nearest You

PRODUCTS

Metal Desks, Filing Cabinets, Tables, Safes, Storage Cabinets, Filing Supplies, Waste Baskets, Storage Shelving, Library Shelving, Aluminum Chairs, Laboratory Tables and Cases, Built-in Metal Wardrobes.

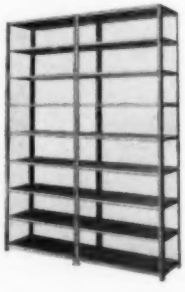
Desks

A full line of steel desks in all sizes and finishes. No warping drawers or splintered edges to ruin stockings. Pleasing Velvoleum tops are easy to write on and easy on the eyes. Never wear rough.



Files

Quiet, easy-rolling drawers of large capacity. Long life, strong and rigid. Drawers never stick shut. Unusual protection to contents. Furnished with lock, if desired.

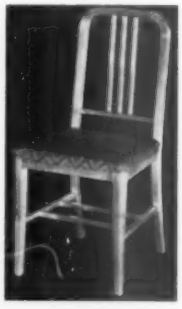


Shelving

Space-saving and enduring. Reduces fire hazard and promotes orderliness in the store room. Optionally reinforced where necessary for varying loads. Can be built fully enclosed with doors and locks.

Aluminum Chairs

Aluminum chairs and tables for school cafeterias. Attractive, light and durable, they provide comfortable facilities for students. Welded construction throughout — maintenance costs negligible—no joints to swell and warp—no rungs or slats to pull loose. Can be supplied with tablet arm for classroom use.



Library Shelving

A special type of shelving for libraries. Adjustable shelves clean and easily kept free of dust. Illustration shows installation for University of Minnesota.

Storage Cabinets

Clean, orderly localized storage for class rooms, laboratories and work rooms. Finished in pleasing olive green, mahogany or walnut. Locks give full control to custodian.

Complete Catalog on Request

THE GENERAL FIREPROOFING CO.

Youngstown, Ohio

NEW YORK
BOSTON
PHILADELPHIA
CHICAGO
PITTSBURGH
CLEVELAND
HARTFORD

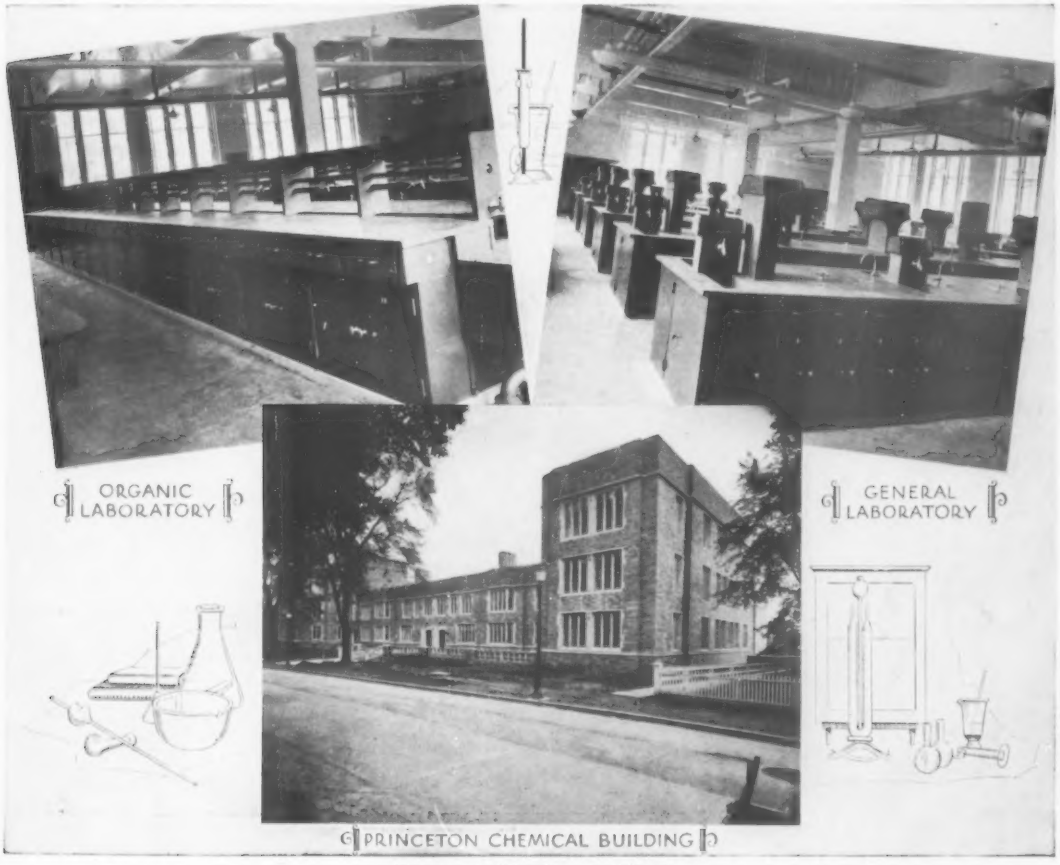
MINNEAPOLIS
ST. LOUIS
LOS ANGELES
SAN FRANCISCO
WASHINGTON
NEWARK

**LABORATORY AND HOSPITAL STEEL CASE-WORK
LABORATORY DESKS AND TABLES, OFFICE EQUIPMENT, STORAGE AND LIBRARY SHELVING**

Laboratory Desks and Tables of GF All-steel possess many advantages not common to other types of tables. Doors and drawers never warp, swell or split. Handles never pull off. Drawers never stick to cause broken glassware.

Built on the unit principle to facilitate installation and repairs to plumbing. Of non-combustible construction, they reduce the fire hazards of laboratories. Continuous tops of Alberene stone are proof against acids.

Below are illustrations of this equipment in new Frick Chemical Laboratory, Princeton University.



Charles Z. Klauder, Architect

THE GLOBE-WERNICKE CO.

Ross and Carthage Avenues
Cincinnati, Ohio

THE TRI-GUARD PRINCIPLE SPEEDS UP FILING AND FINDING

In Globe-Wernicke office, school and library equipment are found the same dependable quality and fine craftsmanship that have made this company a leader in its field for more than fifty years.

FILING CABINETS

There is a G/W file for every business need and price range. Our better grades in steel and wood have many distinctive advantages, including the Tri-Guard principle—the outstanding filing development in years. Each guide slides on three rods, which act as a "sway-check" . . . they support, as well as index, contents of drawer . . . ample working space is available without frequent readjustment of follower. Tri-Guard files speed up filing and finding with less work and greater economy.

HORIZONTAL SECTIONS

HORIZONTAL SECTIONS

Standard stock equipment is available for filing all types of records . . . top, bottom, sides, and back are closed, increasing strength, fire resistance, and protection from dust.

STORAGE AND WARDROBE CABINETS

G/W steel storage and wardrobe cabinets are made in two grades and several sizes. Contents are kept clean and quickly accessible. Loss is prevented—privacy assured. They are fire resistant and practically dust-proof.

STEEL DESKS AND TABLES

Many exclusive features of construction and design make G/W steel desks and tables very desirable for office and school use. They are attractive, sturdy and give satisfactory service for a long time.

STORAGE AND WARDROBE CABINETS

STEEL DESKS AND TABLES

VISIBLE RECORD EQUIPMENT AND SUPPLIES

Visible records provide important facts instantly. They can be used by every business or institution where it is necessary to keep records.

Signals call attention to matters that need prompt attention. This control system saves time, work and money. It is also part of our service to prepare card forms for any type of record.

VISIBLE RECORD EQUIPMENT

STEEL SHELVING

G/W steel shelving gives economical service for a business lifetime. It is easy to install and can be adapted to individual needs and the floor space available. Additional units can be obtained for expansion and shelving may be taken down and reset with 100% salvage.

SCHOOL AND LIBRARY EQUIPMENT

Unusual engineering facilities, together with long experience in manufacturing stock and special school and library equipment are available to help solve the problems of our customers. The quality, efficiency and durability of Globe-Wernicke products are the result of steadfast adherence to high standards in design, construction, materials, and workmanship.

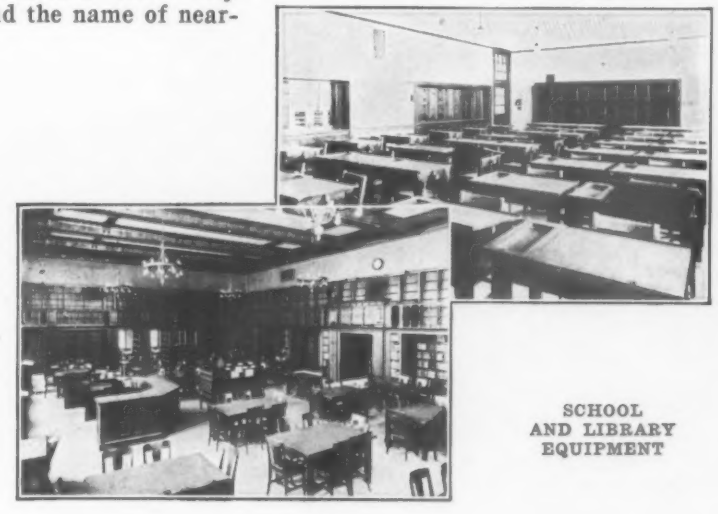
SECTIONAL BOOKCASES — STEEL AND WOOD

This company originated the unit idea in bookcases and has been the leader in their development. G/W sectional bookcases are available in several distinctive designs and standard finishes for school, home and office. They are carefully designed, well-made and finished to combine attractive appearance, convenience, efficiency, and economy.

STEEL SHELVING

Write us for more information about any Globe-Wernicke products and the name of nearest dealer.

SECTIONAL BOOKCASES



SCHOOL AND LIBRARY EQUIPMENT

RCA MANUFACTURING CO., INC.

CENTRALIZED RADIO AND PUBLIC ADDRESS SYSTEM

Camden, New Jersey

Through a Centralized Radio System, the Supervising Principal can include educational radio broadcasts in the daily school work, directing reception from a central point. This is the accepted procedure in the modern school. In designing and producing such apparatus, RCA has drawn upon the experience of the National Broadcasting Company, one of the members of the RCA family, and a leader in educational work by radio. Educators who select an RCA Centralized Radio System are assured that they obtain the best means of reception that radio offers. Such a system reproduces records as well as radio, and can be equipped with a microphone for class room supervision from the central control board.

Control Unit of RCA Victor School Sound System. Includes two RCA Victor All-Wave Radio Receivers with switches controlling speakers in individual rooms, 2-speed phonograph, and microphone with provision for 2-way communication with any or all rooms

Portable Public Address Systems have almost an infinite number of applications to school work. The portable set illustrated is primarily designed for interior use, but special weatherproof loudspeakers may be provided for a permanent installation to which this set can be connected for playground, football and baseball fields. Wherever a school gathering is held, a small public address system is of great aid to instructors, particularly where the acoustics of the meeting room are not satisfactory.

PORTABLE PUBLIC ADDRESS SYSTEM
Includes High Fidelity Velocity Microphone, 20-watt amplifier, two dynamic speakers, entirely portable. Plugs into any 110-volt 60-cycle outlet. Provides enough power to furnish ample volume to audiences up to 2500 persons. May be carried from room to room, and set up in a few minutes

5501

AURAL AND VISUAL AIDS IN EDUCATION

16 MM. SOUND-ON-FILM PROJECTOR

ONE! TWO! THREE! GO!
Threading is as simple as that!

Features

Brilliant picture projection
Superb tone quality
Dynamic speaker on long cable
Ample volume to fill large hall
Tone and volume control
Easy threading
Provision for microphone to add speech to silent pictures
400-foot reels standard, 1600-reel bracket optional
Manual framing and film advance device

RCA Victor Electrola R-95

This RCA Victor Electrola (without radio) has been designed as a low cost instrument with excellent quality in music reproduction for educational use in music appreciation, creative interpretation, and integration of music with other studies.

This fully modern electric phonograph, with its three-tube amplifying system and two watts undistorted output, has excellent tone quality and a surprising degree of volume for so small an instrument. It is readily portable, and can be used wherever the power supply is 110 volts Alternating Current.

List price, $49.95. For details see your nearest distributor, or write the Educational Division, RCA Manufacturing Company, Inc., Camden, N. J.

In cooperation with outstanding educators, RCA has designed and manufactured many devices to enrich the curricula. These instruments are not untried or unproven, for many are adaptations and improvements of devices used in school work for many years.

A few of these products might be listed as follows:

16 mm. Sound Film Projectors
16 mm. Sound Film Cameras
35 mm. Slide Film Projectors
Radio Receivers and Record Player Combinations
Public Address Systems (portable and permanent)
Centralized Radio Systems
35 mm. Portable Projectors
35 mm. Photophone Reproducers (for auditoriums and school theatres)
Victor Red Seal, Black Label, Educational and Transcription Records
Film recording channels for professional use in the production of educational films
Broadcast and short-wave transmitters
Cathode Ray Oscillographs and special apparatus for test purposes.

THE SIGHT LIGHT CORPORATION

342 Madison Avenue, New York City

The Sight Light Corporation developed the Sight Meter, an instrument for measuring light and appraising it in terms of easy seeing. Thousands of Sight Meters are used throughout the world, many of them being employed by educators to control schoolroom lighting with scientific accuracy for the benefit of young eyes.

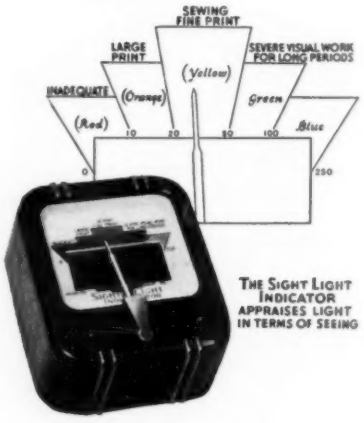
From the use of the Sight Meter, and as a result of lighting problems brought to the attention of Sight Light Corporation executives, other useful and beneficial apparatus has been developed and made available, most of this consisting of scientific lighting equipment. These catalog pages briefly list and describe these specialties and indicate their use in school work. Additional literature and information will be furnished on request.

READING FINE PRINT SEWING ETC.
SEVERE VISUAL WORK FOR LONG PERIODS
0 10 20 50 100
INADEQUATE FOR CRITICAL SEEING
SIGHT METER

The illustration above shows the **Sight Meter,** Catalog No. 703-2, with scale enlarged to show indicia. This is the special instrument developed for eyesight specialists and widely used by them for light prescribing. A similar instrument with scale reading to 50 foot-candles and designated Catalogue No. 703-1, is used chiefly by public utility lighting specialists, school authorities, illuminating engineers. Both instruments are entirely self-contained; require no batteries or outside current supply; are beautifully made; and have become recognized through use as the standard, popular, light-measuring instruments of the world. For professional use, this design is preferred, because its indications are exact and close measurements of lighting conditions can be taken. Size, 4⅝″ x 2⅝″ x 1⁵⁄₁₆″. Weight, 8 ounces.

Cat. No. 703-1,	Sight Meter, 50 foot-candles,	Price $19.50
703-2,	Sight Meter, 100 foot-candles	20.50
710-1,	Multiplying Dise for 703-1	.75
710-2,	Multiplying Dise for 703-2	.75
740,	Leather carrying case for Meter	1.25

Meter can be engraved with owner's name for a nominal charge.



Above is shown the **Sight Light Indicator,** with scale enlarged to show indicia. Like the Sight Meter, it is entirely self-contained. Both instruments operate with a photo-electric cell, which converts light energy into electricity, measuring the electric energy by a meter whose pointer swings over a scale calibrated in terms of light intensity.

The **Sight Light Indicator** is a smaller, simpler, more compact and slightly less precise instrument than the Sight Meter. The scale reads to 250 foot-candles in steps of 10, 20, 50, 100 and 250, and small divisions are eliminated. These steps are colored, and the pointer indicates zones of light intensity which are explained by an index printed on the back of the meter. For the control of classroom lighting, this little instrument is ideal, as its low price permits its purchase for each classroom. Size, 2⁷⁄₁₆″ x 2¹³⁄₁₆″ x 1⅛″. Weight, 7 ounces.

The importance of supplying adequate lighting for classroom activities cannot be overstressed. Young eyes need plenty of light if children are to see well and eyesight preserved. It is actually cheaper to supply proper artificial light than to repeat grades for children who cannot see easily and, therefore, do not learn and cannot pass. The use of a **Sight Light Indicator** in every classroom to guide the teacher in controlling illumination is a distinct economy: It protects eyesight; it accelerates the work of the class; it averts waste of artificial light; and it helps to reduce the percentage of pupils who repeat grades.

Catalog No. 719, Sight Light Indicator, Price $12.50

It is axiomatic that for human welfare artificial lighting should, if possible, duplicate out-of-door illumination. Unfortunately, it is not practical to do so, because of the enormous expense involved, Nature being lavish with light. Modern science has developed means for duplicating natural daylight, but its cost limits it to applications where it is essential.

For centuries, artificial lighting has been held at pathetically low levels of intensity and sadly deficient quality, due to ignorance and cost. We now know how to obtain adequate quality and the best lighting installations produce it. As yet, we have generally failed to provide adequate intensities of indoor illumination, but the use of the Sight Meter is gradually producing an appreciation of the benefits of plenty of light and many school authorities are installing lighting equipment to provide it.

It is accepted that the best quality of artificial lighting is obtained by the indirect system. By "indirect" is meant that arrangement of light source which hides the lamp from direct vision and reflects its light energy from the ceiling and walls of the room. This system diffuses the light so that an even illumination of soft quality is obtained on working surfaces, a condition similar to that produced by the diffusion of sun light by the atmosphere. It is so commonly employed that a full discussion of its merits need not be promoted here.

In the case of new buildings now being built, the installation of lighting equipment can and should be made to provide those high intensities of diffused illumination which are essential for easy seeing. The services of the lighting specialist will pay well in the improved lighting obtained by following his recommendations. In existing buildings, however, conversion of existing lighting equipment and the use of existing wiring circuits are seldom practical. The expense of rewiring and refixturing for a modern, adequate installation is a serious deterrent to the performance of this important work, and a compromise job is almost certain to be unsatisfactory. If there were available a system of lighting which would provide high intensity, diffused illumination on desk or table without the penalty of low efficiency, it would be desirable. Such a system is available; we developed it, and have it for sale.

Sight Light Five, here illustrated, is the most useful form of such a localized lighting system. It is a completely indirect unit **with its own ceiling,** the light source being hidden from view and the ceiling so devised as to diffuse and distribute the light over an area about three and one-half feet in diameter.

Sight Light Five is a desk or table lamp. With a single 100-watt ordinary lamp bulb, it provides that desirable quantity and quality of light essential to the easy seeing of such visual tasks as studying, clerical work, stenography, and prolonged reading. For school library tables, which are not over three and a half feet wide, this lamp is recommended. Each lamp will well serve four readers, two on each side of the table. It should be screwed on the center line of the table and spaced on the line between adjacent chairs. Thus on a 3½ feet by 9 feet table, seating eight students (four on each side), two Sight Light Fives will provide that high intensity, diffused illumination most favorable to easy study. **It must be mentioned that this lamp is not intended for and should not be used as the only source of light in a room.**

Sight Light Five is constructed entirely of metal, except for rubber, fibre and porcelain insulation and felt feet. It is a very substantial device, good-looking, and inconspicuous.

Height, 14 inches; diameter, 12 inches; weight, 8 pounds; finish, bronze. It is all but indestructible, easy to clean, and built for a long lifetime of service. Price, $15.00 each.

Other forms of this lamp are available for specialized applications and more will be developed as experience may dictate. At present we offer:

Sight Light Six, a floor lamp for chair-side, bed-side, and card table illumination. The same fine light from an independently supported lamp with adjustable standard. Price, $20.00 each.

Sight Light Eighteen, a double-hinged arm like the human arm, clamped or screwed on bench or table, and holding the lighting system always at the proper height above the working surface. Ideal for the drafting table, the work bench, or on desks and tables where the entire surface must be kept free for work. This lamp has many important applications. Price, $17.50.

The Sight Light Corporation welcomes correspondence from school authorities and gladly will give them the benefit of its wide experience with seeing problems.

THAYER TELKEE CORPORATION

GENERAL SALES OFFICES
108-114 East 17th Street
Los Angeles, Calif.

GENERAL EASTERN DISTRIBUTOR
P. O. MOORE, INC.
300 Fourth Ave., New York

UNIT H. T.
Open and Closed

TelKee Cabinets, equipped with swinging panels, provide the greatest accessibility for ease and efficiency in the control of keys.

The triangular shaped doors open outwardly and when fully extended make a complete spread of 39 inches.

The capacity of these cabinets ranges from 500 to 1,000 hooks, according to the number of panels used. Panels swing in pin and socket bearings, top and bottom. Panels being of uniform size, a cabinet of 500 capacity may be increased in steps of 100 at any time by procuring additional panels at a nominal cost.

This model is also built in a lower height (Unit L. T.) with panels of 50 hook capacity each. Unit L. T. may be built up from 300 to 500 hook capacity as requirements may demand, in steps of 50 hooks.

Three compartments in the base provide space for a 3 x 5 card index for records pertaining to the key system, with two additional compartments to accommodate a supply of markers, receipt holders, etc. A pocket in the door panel carries the loose leaf book index. This unit is designed for use on counter, table or desk or can be attached to a wall. When desired, the special stand, shown in illustration, can be supplied. Cabinet is equipped with key in handle lock.

TELKEE System of Key Control, for many years, has been standard equipment in institutions of every character wherever numerous locks are in use.

TELKEE is used extensively by the United States Government; is also in general use throughout the country in Schools and Colleges.

TELKEE offers many specially designed units for control of keys under any condition of operation.

TELKEE offers to the custodian of keys a simple and efficient system from the standpoint of economical maintenance.

TELKEE VISIBLE KEY CONTROL SYSTEM CABINETS

OPERATING FEATURES OF THE TELKEE SYSTEM

The TelKee System of Key Control provides a method for filing and quick finding of keys in specially designed steel cabinets, with positive and permanent identification of keys, indexed alphabetically and numerically.

One original key to each lock is permanently identified, for use as a "Reserve-Pattern" key, with a TelKee permanent key MarKer which has a patented clasp that locks to the key by pressure of the thumb. The MarKer is die-stamped "File Key—Must not be Loaned" and, with the key, is always preserved on the TelKee File Hook as the pattern key for that lock for use only in emergency or from which duplicates shall be cut.

With the labeled hook and the correspondingly labeled MarKer locked to the "Reserve-Pattern" key, the key identification is complete.

Hook 206—showing Reserve-Pattern Key with permanent MarKer attached, and two unissued duplicate keys with temporary MarKer attached.

Hook 207—showing Reserve-Pattern Key. Duplicate keys have been issued with no receipt taken.

Hook 208—showing Reserve-Pattern Key, together with Receipt Holder carrying complete Receipt Record for the Duplicate keys issued.

The Hook itself has sufficient depth to accommodate five keys.

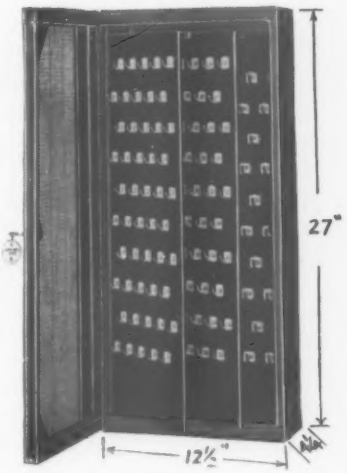
Duplicate Keys are identified with a TelKee Detachable type MarKer until issued to user as "Active Keys", after which they are replaced by a Receipt Holder with a signed receipt of the borrower.

TelKee Visible Filing Units are of furniture steel, conforming with other steel office equipment.

Complete catalogue and samples of MarKers and Index Sheets sent upon request.

WALL CABINET

Compact wall cabinet using standard TelKee panels of 100 hooks each, fifty hooks on the back wall and two swinging panels of 100 hooks each, give a total capacity of 250 hooks.



UNIT W. C.

Cabinet may be had with one panel and the second panel added as future requirements may demand. The inside of cabinet door carries a visible key index sheet.

THE PERFECTED SYSTEM FOR CONTROL OF KEYS

The principal causes for the expense, confusion, risk and annoyance in the maintenance of any large number of locks are:

1. Loss or misplacement of all keys to a lock or locks.
2. Use of keys made from duplicates (not originals).
3. No positive and permanent identification of keys.
4. Unauthorized possession of keys.

TelKee, installed as a Central Key Control for the keys to all the locks in a building or series of buildings, with Reserve-Pattern and unissued Duplicate key markers, with receipt holders and receipts for all issued Duplicates and with cross indexes for code number indexing alphabetically, numerically and by lock serial, will control and eliminate these faults of any unsystematized method of handling keys. It is easy to install and good for the life of the building.

Patented and Manufactured by

Thayer TELKEE Corporation

LOS ANGELES, CALIFORNIA

WESTERN ELECTRIC COMPANY

New York, N. Y.

Distributor in the United States

GRAYBAR ELECTRIC COMPANY

Graybar Building, New York, N. Y.

Distributor for Canada and Newfoundland

NORTHERN ELECTRIC COMPANY, LIMITED

General Offices and Plant: 1261 Shearer Street, Montreal, P. Q.

Western Electric

SYSTEMS FOR AMPLIFYING AND DISTRIBUTING SOUND

General

Western Electric equipment picks up, amplifies, and distributes speech and music to an audience in a large room—to many rooms in a building—and to points out of doors.

Developed by Bell Telephone Laboratories for the Western Electric Company, this apparatus assures high-fidelity sound reproduction. It is built on Wide Range Sound principles, like Western Electric sound equipment in the finest talking picture theatres.

Even a Small Voice Fills the Largest Auditorium

Many up-to-date schools, colleges and universities have found Western Electric equipment valuable—for both educational and administrative uses.

Essential Parts of the System

(1) One or more microphones for picking up sound.
(2) The Western Electric Reproducer Set, if recorded programs are desired.
(3) A Western Electric Radio Receiver, if broadcasts are to be reproduced.
(4) "Mixing" and control panels.
(5) Amplifying apparatus.
(6) Observer's communicating system for auditoriums.
(7) Receivers and loud speakers.
(8) Necessary wiring and circuits.

By using a microphone and a selective switching system, announcements or instructions may be delivered to any number of classrooms simultaneously. With the Reproducer Set, which plays standard phonograph records, recorded programs may be similarly distributed. And with the Radio Receiver, broadcasts of educational value may be reproduced wherever desired.

Uses in Schools

(1) Delivering a general order instantly throughout the building—e.g., fire drill instructions.
(2) Transmitting music for music appreciation courses or for entertainment to any number of selected rooms.
(3) Transmitting gym instructor's commands to all rooms at once.
(4) Conveying a visitor's or special instructor's words to all parts of the building.
(5) Distributing educational radio broadcasts to any or all classrooms.
(6) Amplifying speaker's voice in the auditorium—particularly important for children's weak voices.
(7) Amplifying speech at outdoor exercises, pageants or plays.
(8) Announcing at athletic events, either in the gym or in the stadium.

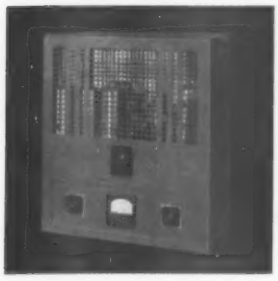
The Reproducer Set Operates for a Few Cents an Hour

Cost and Service

The cost of Western Electric sound distributing equipment is relatively small, consid-

ered in the light of the many valuable services it performs. Graybar Electric engineers will gladly survey your buildings, recommend an installation to meet your particular needs, furnish complete specifications and an estimate of cost.

Stocks of spare parts are maintained at strategic points from coast to coast in order to assure quick replacements and repairs.



The Western Electric 1086B Amplifier is a New Wide Range, High Gain, General Purpose Amplifier—Ideally Suited for Use in School Sound Distributing Systems

Partial List of Users of Western Electric Sound Distributing Systems

East

Yale University, New Haven, Conn.
Rindge Technical High School, Cambridge, Mass.
Worcester Polytechnic Institute, Worcester, Mass.
Dartmouth College, Hanover, N. H.
Wyoming School, Millburn, N. J.
Trenton Senior High School, Trenton, N. J.
Brooklyn Technical High School, Brooklyn, N. Y.
College of the City of New York, New York, N. Y.
Far Rockaway High School, Far Rockaway, N. Y.
Mamaroneck High School, Mamaroneck, N. Y.
Temple Medical College, Philadelphia, Pa.
Pennsylvania Academy of Fine Arts, Chester Springs, Pa.

South

Hope High School, Hope, Ark.
Jeff Davis School, New Orleans, La.
City High School, Bastrop, La.
Vanderbilt University, Nashville, Tenn.
School for Deaf, Austin, Texas
Galveston Junior High School, Galveston, Texas
East End Junior High School, Richmond, Va.

Middle West

University of Illinois, Urbana, Ill.
Proviso Township High School, Maywood, Ill.
Technical High School, Indianapolis, Ind.
Iowa State College, Ames, Iowa
University of Kansas, Lawrence, Kans.
River Rouge High School, River Rouge, Mich.
Ford Trade School, Dearborn, Mich.
American Conservatory of Music, Detroit, Mich.
Robert Fulton School, Minneapolis, Minn.
Hadley Vocational School, St. Louis, Mo.
St. Monica School, Cincinnati, Ohio
James Ford Rhodes High School, Cleveland, Ohio
Webster Junior High School, Oklahoma City, Okla.
Milwaukee Vocational School, Milwaukee, Wis.

Far West

St. Ignatius High School, San Francisco, Calif.
Stanford University, Palo Alto, Calif.
Los Angeles High School, Los Angeles, Calif.
Pasadena Junior College, Pasadena, Calif.
Colorado Agricultural College, Fort Collins, Colo.
University of Washington, Seattle, Wash.
University of Wyoming, Laramie, Wyo.

Testing Hearing Acuity with the 4A Audiometer

Western Electric Audiometers

Poor classwork often is caused by poor hearing. With the Western Electric 4A Audiometer, pupils' hearing acuity may be measured quickly and accurately—with the same standard of measurement for all.

The 4A Audiometer consists of a turntable with magnetic reproducer—and from 8 to 40 headsets for listeners. It plays records scientifically designed to show degree of hearing loss. Pupils write what they hear on data sheets. By checking these sheets against a master sheet, even slight hearing defects are quickly seen.

For full information, write the distributors.

Air Conduction Type Audiphone

Western Electric Audiphones

For the hard-of-hearing, Western Electric makes both individual and group hearing aids. Individual Audiphones—using either air conduction or bone conduction receivers—are available in varying models to meet particular needs. With the Group Audiphones, the speaker's words are picked up by a microphone, amplified, and delivered through light, individual headsets. Further details from the distributors on request.

Bone Conduction Type Audiphone

ALL-STEEL-EQUIP COMPANY

Incorporated

GENERAL OFFICES AND FACTORY

550 Griffith Avenue, Aurora, Illinois

New York, N. Y., 56-58 West 22nd Street Chicago, Ill., 326 South Jefferson Street

BRANCH AND SALES OFFICES IN PRINCIPAL CITIES

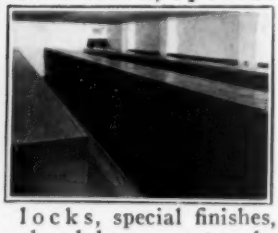
Write for Latest Catalog of School Equipment

LOCKERS MODERNIZED BY A-S-E

New beauty of appearance with an entirely new and true locker handle, thoroly modern louvres, and an entirely smooth door are found in the new and thoroly modern A-S-E locker.

Furnished in all types and sizes as well as key cabinets, basket racks, baskets and special equipment also provided.

Six-inch sloping tops, extra shelves, special



locks, special finishes, closed bases, coat rods, vertical partitions, special ventilation and louvre equipment—available to order.

A-S-E Lockers are made from hot rolled annealed steel, stretcher-leveled. Doors of No. 16 gauge cold rolled, patent leveled sheets. No notches cut in angle frame for the concealed, practically unbreakable hinges. Body No. 24 gauge steel throughout. Finished in olive green, French grey, school furniture brown. Other colors to order.

In every detail of construction, A-S-E Lockers are ruggedly built to provide years of school use and abuse.

The wide range of types and styles permits virtually every school locker need to be efficiently answered. Send for Catalog A-30 for complete details.

PRODUCTS AND COMPANY

Steel lockers, steel book shelving; steel storage, filing and wardrobe cabinets; steel transfer cases, card cabinets, drill cabinets, typewriter tables; steel stacking boxes and shop equipment.

A-S-E has been established over 23 years; is a national concern that has pioneered the development of modern steel equipment.

ENGINEERING SERVICE

A-S-E offers an experienced and intelligent consulting and design service to help provide maximum efficiency in the utilization of available space. Branch offices provide prompt and accurate supervision service.

CABINETS

Two complete lines. "Master" provides the finest construction features known. "Popular" answers need for durable, attractive cabinets at low cost.

In all, 57 models to meet every school need. These include—storage, wardrobe, combination, desk and counter high, tabulating card, glass door, etc. Can be recessed in wall.

Made from selected steel with heavy frame. Concealed hinges. Vault type chromium plated handles. Baked enamel base coat with two coats of lacquer. Olive green standard—French grey, white or mahogany or walnut finish to order.

PATRICIAN SHELVING

A particularly distinctive shelving that combines practicalness and flexibility of use with strength and fine appearance. A-S-E Patrician shelving stands out among modern and high class commercial types.

Patrician Shelving in School Library

It offers the beauty of fine wood with the advantages of steel. Furnished in a great number of various types for school use.

Molded trim and beautiful cornice at top add outstanding beauty. Shelves are easily moved. Base is 6 in. high—closed all around for cleanliness. All parts have baked on enamel coat, then are hand sprayed with two coats of high-grade lacquer. Choice of—olive green, autumn brown. Other flat colors and wood finishes in walnut or mahogany to order.

ALLIED RADIO CORPORATION

833 W. Jackson Blvd., Chicago, Illinois

Allied Radio
CORPORATION

"EVERYTHING IN RADIO"

PUBLIC ADDRESS FOR THE SCHOOL

Public Address plays a vital part in education today. Each year, more and more schools are installing Radio Sound Distribution Systems and are finding increasingly valuable educational applications in their use. A Sound System is indispensable for the distribution of educational broadcasts, either from radio or from within the school itself; it makes it simple to address classes instantaneously for announcement or emergency purposes; it can be used effectively for musical and dramatic performances, for gymnasiums, outdoor athletic fields, overflow crowds, etc. No school can regard itself as being up-to-date unless it is equipped with a dependable Public Address System.

The increasingly important role played by Public Address in modern education makes the selection of a suitable Sound System a matter of real concern and importance. The individual requirements of the school must be carefully studied by experts; the equipment must be selected in an exacting manner based upon dependable experience. The ALLIED Sound Engineering Division offers you a wide range of experience in handling innumerable sound projects; it places at your disposal a high degree of engineering skill to solve your individual Sound problems accurately and inexpensively.

QUALITY SYSTEMS AT LOW COST

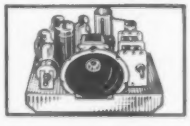
We are prepared to quote attractive prices, either for replacement and additional equipment in present Public Address Systems or for entire apparatus to meet the individual requirements of the System you are planning. Our extensive experience in serving the leading schools and institutions in the country, qualifies us to cope with any Sound problem. Whether you require a multi-speaker system for every room in the school, a single speaker for a small hall, or a giant system for an athletic field, we can fill your specific needs at the lowest wholesale prices. ALLIED Public Address Systems feature high fidelity of tone, extreme simplicity of operation, and low cost, both initially and in maintenance.

FREE CONSULTING SERVICE

We invite you to submit your Public Address specifications to our Sound Engineering Division for careful consideration and valuable advice, without any obligation on your part. Floor plans, sketches, etc., are desirable; all data will be confidentially treated and returned safely. We maintain a large staff of technicians and a completely equipped laboratory for studying your problems; we are prepared to quote attractive prices for equipment covering your particular needs. No matter what your sound problem is—whether complicated or simple, large or small, costly or inexpensive, we will give it careful and prompt consideration.

YOU ARE INVITED TO WRITE FOR OUR FREE CATALOG

PARTS AND KITS FOR RADIO CLASSES AND CLUBS



We specialize in serving radio classes and clubs with specially matched kits of parts required for building any type of circuit. We are Radio Parts Headquarters and will be glad to quote attractive prices for any type of radio equipment. Our Engineering Division is constantly at your service, ready to render helpful service without obligation.

FREE DIAGRAMS AND PARTS LISTS

We supply free complete parts lists for building all of the popular radio circuits described in the leading radio magazines and handbooks. We can also supply free wiring diagrams for all types of receivers, etc., and will be glad to send quantities desired to radio classes and clubs upon request. Our complete catalog listing of radio books will also prove to be of interest to radio and electrical class instructors.

RADIO EQUIPMENT FOR THE LABORATORY

As Radio Supply Headquarters we serve many schools and institutions with high grade laboratory radio equipment. We feature a complete line of Oscillographs, dry and wet cell Batteries, Test Equipment, Vacuum Tube Voltmeters, Ohmmeters, Ammeters, etc., Converters, Generators, Photo-cells, Relays—everything for the modern up-to-date laboratory at the lowest prices. Fill your laboratory needs with tested, dependable, low cost equipment from ALLIED RADIO. Keep a copy of our current catalog on file—it is a true index to everything in radio.

THE AMPRO CORPORATION

2839-51 North Western Avenue, Chicago, Illinois

SPECIALISTS IN 16MM. EQUIPMENT FOR VISUAL EDUCATION

The idea of Visual Education needs no introduction. It is well known that the average student learns more readily and thoroughly from a picture than from type or lectures. However, the matter of equipment by which Visual Education may be practiced constitutes a subject that demands careful consideration.

The class room is not an auditorium. It is neither designed nor built for projecting motion pictures—it is light and cannot be totally darkened, and it has no booth in which projecting noise can be confined. First and foremost, then, the projector must be capable of showing a large and brilliant picture in a semi-dark room, and the mechanism must be quiet so that the student's attention is not distracted. Also, the matter of the student's eyesight is a major consideration. The projected pictures must be distinct, flickerless and steady. This requires an optical system of quality, and a mechanism in which precision is the keynote. The Ampro Projector fully meets all these requirements.

The school teacher is not as a rule of a mechanical mind. His or her hands are not trained to the "feel" of machinery, and seldom has he or she developed an understanding of such an elaborate mechanism as a motion picture projector. It is interesting to observe how completely and perfectly Ampro meets this need for a simple, easily operated machine.

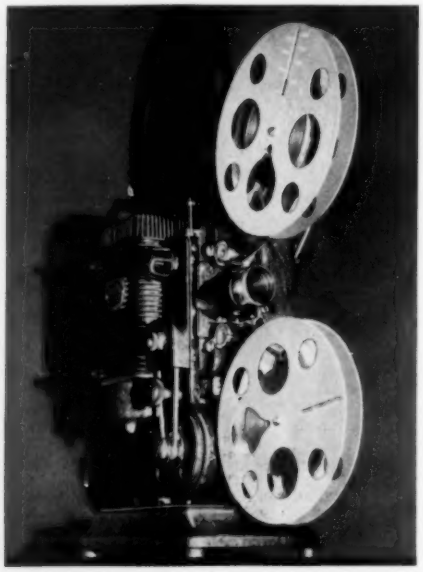
Ampro Projectors and sound equipment, a product of twenty years' experience in manufacturing precision instruments, have been accorded unconditional approval in thousands of schools and colleges the world over. They have gone to Tokio, to Shanghai, to Moscow, London, Cape Town and to other places far outside the circle of quick factory service. Ampro has been bought by school systems everywhere because its features elect it the most desirable projector for school work, and because its mechanism is obviously so well built that the possibility of urgent service need is remote.

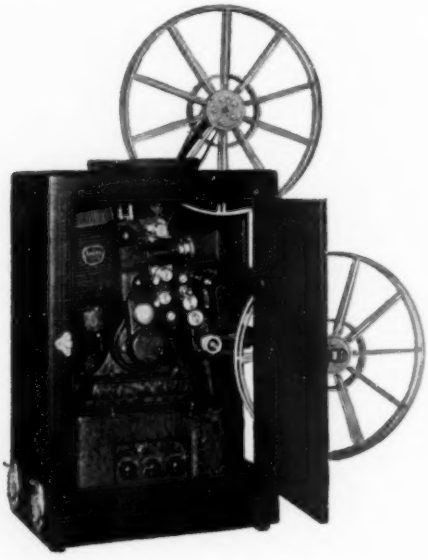
SOUND AND SILENT PROJECTORS FOR CLASSROOMS AND AUDITORIUMS

Below, at the left, is illustrated the Ampro 750-watt silent projector. Simplicity of operation is the keynote; all controls conveniently placed—750 watt lamp used—easy to set up and put away—entirely portable—and the choice of thousands of schools. Three 750-watt models to choose from, as well as three 500-watt models.

To the right is illustrated the Ampro Model "S" Sound On Film Projector, an instrument designed for faithful tone reproduction, with a frequency range from 50 to 7000 cycles, and 30 watt capacity for large auditoriums, with theatrical sound quality. As easy to operate as a radio. The 750-watt lamp with Ampro special optical system provides "theatre brilliance" illumination. Has full 1600′ reel capacity, fast automatic rewind, complete range of speeds for showing silent pictures as well as sound, can be run either in or out of the case, and entirely portable.

Illustrated bulletins and detailed specifications will be furnished on request. Branch offices, dealers and representatives everywhere.





BAUSCH & LOMB OPTICAL COMPANY

655 St. Paul Street, Rochester, N. Y.

New York Chicago Boston Los Angeles San Francisco
London, England Frankfurt A/M, Germany

LRM BALOPTICON

Your auditorium or large lecture hall should be equipped with the LRM combination distance projector—for both opaque objects and slides. Specially designed parabolic reflectors produce an unusually bright shadow-free image from a 500-watt lamp. This feature has made the LRM an outstanding Balopticon.

Standard slides, and opaque objects up to 6 inches square, or 6-inch square sections of larger objects can be projected.

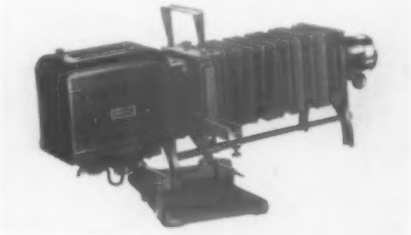
Model KOSB Balopticon also projects lantern slides and opaque objects. It is designed for use with a translucent screen.

B & BDT BALOPTICON

Model BDT Balopticon is a slide projector mounted on a heavy adjustable tilting base. This mounting allows for changing the projection angle for screens at various heights.

Projection distances range from 15 to 60 feet, depending upon the lens equipment, and the image can be as large as ten feet on its longer side. Still film, micro-projector and overhead projector attachments are available.

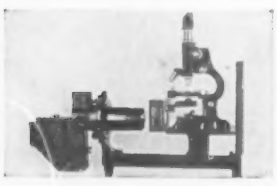
Model B Balopticon is identical with Model BDT in every detail except that it has no tilting base.



ERM BALOPTICON

Model ERM Balopticon is used to project opaque objects only. For that reason, economy is one of the major advantages of this projector. Photographs, pages or pictures from books, charts, drawings, actual objects such as botanical specimens are all excellent materials for this projector. Projects a 6″ square area of object but pages, charts, etc., up to 14″ can be accommodated.

MODEL B MICRO-PROJECTOR



Now Bausch & Lomb offers a new Micro-Projector at a new low price. Any standard compound microscope can be used.

Simply place the microscope on the stage of the projector in an upright position, apply the prism reflector cap to the microscope and focus the illuminator.

Investigate this new instrument before completing your plans for science laboratory development.

TRIPLE-PURPOSE MICRO-PROJECTOR

Can be used to project mounted specimens on a screen or wall, make drawings of microscopic subjects, project living specimens in liquids on a screen.

BALOPTICON TABLE

The B & L Balopticon Table provides a means of placing a Balopticon where it can be used to best advantage. It is portable (rollers on two front legs), and has a shelf underneath for slide boxes.

OTHER BAUSCH & LOMB INSTRUMENTS

The instruments listed herewith are but a small part of the complete line of B & L products for the Educational field. If you have need for advice or information on any optical products whatsoever, Bausch & Lomb will welcome the opportunity to be of service to you.

VICTOR ANIMATOGRAPH CORP.

184 Victor Building, Davenport, Iowa

New York City Chicago Los Angeles

In Educational, Industrial *and* Religious *Service*

ANIMATOPHONES

(VICTOR 16 MM SOUND-ON-FILM REPRODUCERS)

OUTNUMBER ALL OTHER 16MM SOUND PROJECTORS COMBINED

PRICE need no longer prove an obstacle to the enjoyment of QUALITY sound picture reproduction. Model 25 Animatophone is priced only slightly higher than good silent equipment.

A Demonstration will convince you that VICTOR is your only logical choice of Motion Picture Equipment. Write for Literature.

THE AMERICAN SCHOOL AND UNIVERSITY

BELL & HOWELL COMPANY

1850 Larchmont Avenue, Chicago, Ill.

New York Hollywood London

Manufacturers of

Educational, Professional and Personal Motion Picture Equipment

BELL & HOWELL FILMO *and* FILMOSOUND...

VISUAL EDUCATION EQUIPMENT

Economical and Kind to the Eyes

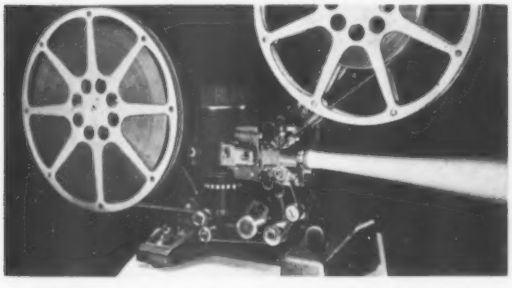
Two basic considerations enter into every purchase of visual equipment—cost and eye ease.

The educated mind does not confuse cost with price but, in the case of projection equipment, recognizes "cost" to include initial equipment price **plus** operating expense, repair and replacement expense, and expense occasioned by film wear. In the case of Bell & Howell equipment the **cost** is unmatchably low. This is because B&H projection equipment is so superbly built that its operation is flawless and continuous, it is almost "foolproof" against misuse, and after years of continuous service has the highest "used" value of any projection equipment made.

As for first cost—the prices are not much in excess of mediocre equipment. Moreover, convenient rental-purchase plans are available where desired.

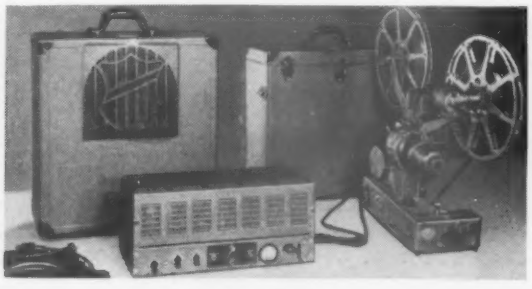
Eyestrain, the second point that must always be considered, is the result of jump and flicker, both of which are entirely absent in Filmo and Filmosound equipment, which is supreme in the eye ease afforded.

For 28 years, Bell & Howell have been recognized as the leading manufacturers of precision equipment for the professional film laboratories and motion picture studios. It is only logical that they should consequently provide the world's educational institutions with comparably fine visual instruction equipment.



FILMO 129 PROJECTOR

16 mm., 750-watt projector produces hour-long motion picture presentations of theatrical quality. 1600-foot capacity. A most popular B&H projector at low cost. For the largest auditoriums, there is the 1000-watt Filmo 130 Projector.



FILMOSOUND 130

16 mm., 1000-watt sound-on-film reproducer. 1600-foot capacity. Produces pictures, accompanied by sound, that are in every respect comparable to professional motion picture theater presentations. There is also the 750-watt Filmosound 120.

FILMO S

Low priced 16 mm. projector of Bell & Howell's typical high quality. 500- or 750-watt lamp, 400-foot film capacity. Ideal for classroom use, and for the smaller auditorium.

Write for full information about any motion picture equipment. We will gladly supply **free** literature pertaining to projectors, silent or sound, or motion picture cameras. Ask also about the B&H **Rental-Purchase Plan** and the B&H **Film Rental Library.**

THE AMERICAN SCHOOL AND UNIVERSITY

CHICAGO MUSICAL INSTRUMENT CO.

309 SOUTH WABASH AVENUE, CHICAGO, ILLINOIS

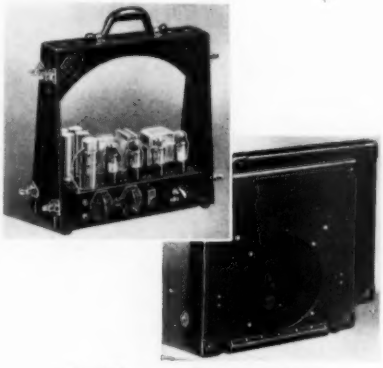
MAESTRO BROADCASTERS

8-Watt to 30-Watt Amplifiers . . . Twin Speakers . . . High Fidelity Crystal Microphones

Made by Webster Electric Co., Racine, Wis.

PORTABLE MODELS

Maestro Portable Broadcasters represent the utmost in clarity, fidelity, sensitivity and carrying power. Four models: 8-watt single speaker, 8-watt twin speaker, 12-watt twin speaker and 15-watt with two or four speakers. All are equipped with latest type high fidelity crystal microphones. Prices from $145.00 to $350.00.



Amplifier and Twin Speakers

Crystal Microphone

PHONOGRAPH ATTACHMENT

For playing records through Maestro Broadcaster. Two speed motors for 78 and 33 1/3 records, high fidelity pick up, strong, handsome cases, finest quality throughout.

Portable Phonograph for Reproducing Records

STADIUM BROADCASTER

Extremely powerful, mobile unit for outdoor or indoor use. Capable of covering outdoor audience of ten to twenty-five thousand people. 30-watts with two speakers to 60-watts with four speakers. Speakers are of dynamic, expotential type, giving clear and powerful reproduction. Finest crystal microphone. Prices $600.00 to $1,000.00.

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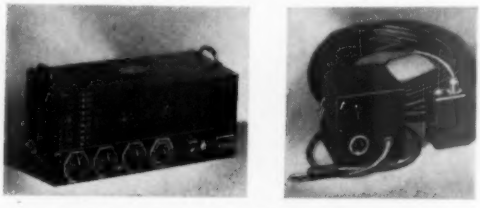
Hand crystal microphone with pocket transformer permitting the use of from one to four hundred feet of cord for football or other sports announcing in connection with Stadium Broadcaster.

The Webster Company's corps of trained sound and acoustic engineers is at your service. Write us regarding your amplification problems. Maestro Broadcasters are sold through music stores everywhere. Write for catalog and name of your closest dealer.

Stadium Speakers, Spheroid and Hand Microphones

MUSICAL INSTRUMENTS

We are national distributors of such famous lines as Olds trombones, trumpets and cornets; Martin and Indiana band instruments; Bettoney clarinets, flutes and piccolos; L & S drums, tympani and xylophones and other fine lines of band and orchestra instruments and accessories, sold by principal music stores. Correspondence from school musical authorities invited.



30-Watt Amplifier and Side-line Outfit

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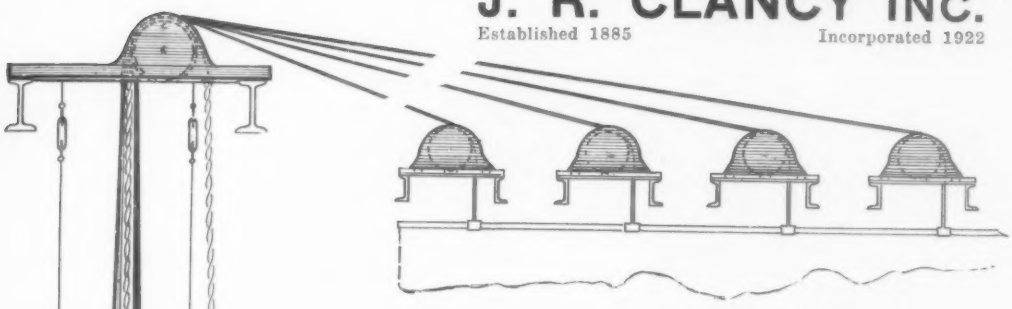
THE AMERICAN SCHOOL AND UNIVERSITY

J. R. CLANCY INC.

Established 1885 Incorporated 1922



Theatrical Stage Rigging and Hardware

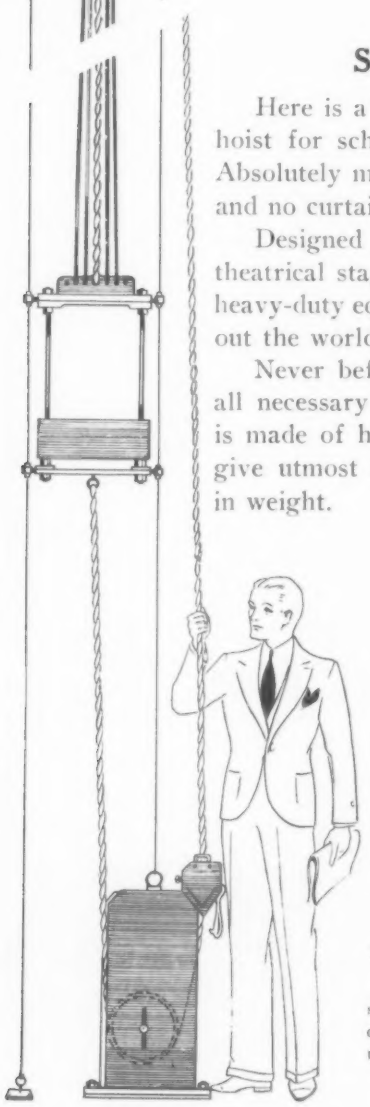
Syracuse, N. Y.

SCHOLASTIC CURTAIN HOIST

Here is a new, popular priced but simple and practical curtain hoist for school or college auditoriums and light theatrical use. Absolutely modern, there are no loose ropes to handle, no tie-offs and no curtain sag.

Designed and manufactured by America's foremost maker of theatrical stage hardware, it incorporates the principles of Clancy heavy-duty equipment used extensively by leading theatres throughout the world for half a century.

Never before has such a fine set been offered, complete with all necessary equipment, ready for installation, at this price. It is made of high grade material throughout and is guaranteed to give utmost satisfaction on all types of curtains up to 450 lbs. in weight.



Here Are the Special Features

Simple and easy to install.

Occupies a minimum of space.

Any curtain up to its capacity raised and lowered with one hand. (This is due to the perfect counterbalance system used on Clancy hoists.)

Furnished complete — ready for installation.

Price: Only $65.00

Underhung blocks can be furnished at slight additional cost.
Manually operated sets — as low as $18.00

F.O.B. Factory. Prices Subject to Change Without Notice

NOTE: Due to variations in height of gridirons and length of proscenium openings, we are unable to include purchase line rope (⅝") or wire cable (¼"). If information regarding correct lengths is furnished, a quotation will be given—or these may be purchased locally.

Write for complete illustrated catalog

CORBIN CABINET LOCK CO.

THE AMERICAN HARDWARE CORP., Successors

New Britain, Conn.

New York — Chicago — Philadelphia

BUILT-IN LOCK No. 781MC (Actual Size)
Masterkeyed and Combination Change Feature
Direct Dialing Built-In Combination Locker Locks

Outstanding Features

1. **Direct Dialing (dial direct to combination numbers).**
2. **Large Dial Face for better visibility, especially in dark corridors and locker room aisles.**
3. **Combination changeable many times and without unlocking door.**
4. **Requires less than five seconds to change combination numbers.**
5. **Maximum Security.**
6. **Unlimited Combinations.**
7. **Automatic Combination Throw-Off.**
8. **Furnished with or without Masterkey Mechanism.**
9. **Furnished with or without Combination Change feature.**
10. **Sight Dialing or Click Dialing.**
11. **Sight or Click Dialing combined.**
12. **Lost Combinations can be recovered.**
13. **Can be used for replacement work, fitting same piercings as the conventional type flat key locker lock.**
14. **Made either with latch or dead bolt.**

CORBIN

Simplified Direct Dialing LOCKER LOCKS

Never before has a combination lock, either padlock or built-in locker lock, been offered to schools, universities, and institutions that embodies all the features contained in these new Corbin Combination Locks.

Stylish appearance, simplified mechanism, plus maximum security, the fact that they can be masterkeyed and the combination changed on the built-in locker lock by those authorized, are a few of the many new Corbin features found in these locks. The Corbin "Click" mechanism can also be incorporated, giving to the user "Sight" or "Click" direct dialing.

Write for combination lock literature illustrating and describing our complete line.

Other Corbin LOCKER LOCKS

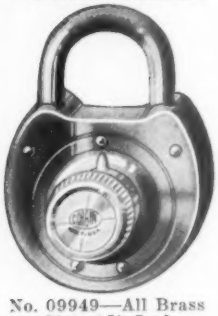
SIMPLIFIED DIRECT DIALING

No. 9881—2 Inch—Sight Dialing
No. 9881D—2 Inch—"Click" Dialing Masterkeyed
No. 9880—2 Inch—Sight Dialing
No. 9880D—2 Inch—"Click" Dialing Not Masterkeyed

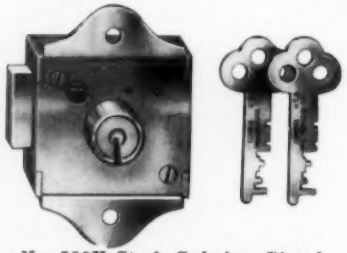
SIGHT DIALING

No. 09919—All Brass
No. 09919½ — All Brass, Buffed Nickel
Size, 1⅝ Inch
No. 09920—All Brass
No. 09920½ — All Brass, Buffed Nickel
Size, 2 Inch

"CLICK" DIALING



No. 09949—All Brass
Size, 1⅝ Inch
No. 09950—All Brass
Size, 2 Inch



No. 582X Steel, Cadmium Plated
Heavy Brass Bolt—Secure Levers
Size, 1½ x 1⅝ Inches

KEYED LOCKS

No. 09880 Cast Bronze, Polished
—Secure Levers
Size, 1 7/16 Inch

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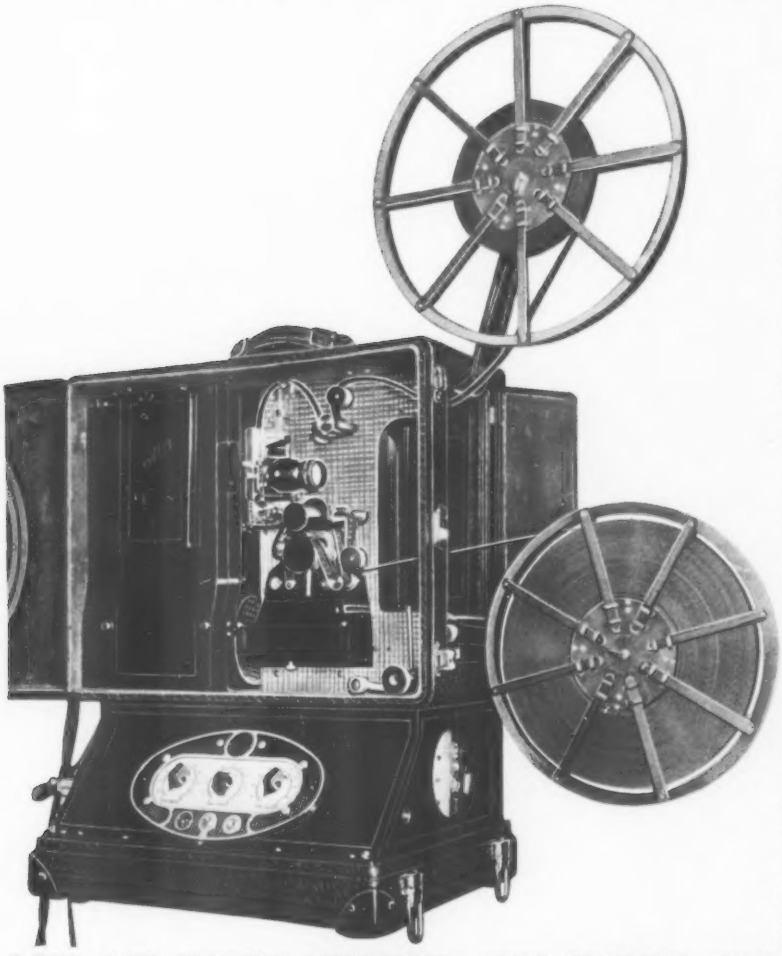
DeVRY *announces!*
A REVOLUTIONARY FORWARD STEP



DeVRY 16 MM. SPROCKET INTERMITTENT SOUND PROJECTOR — WITH SILENT CHAIN DRIVE AND DOUBLE EXCITER LAMP SOCKETS. ILLUMINATION AND VOLUME, AMPLE FOR AUDIENCES OF 1500

IN 16 MM. PROJECTION

Although ALL theatre machines years ago abandoned the claw movement for the Geneva Movement, 16 mm. machines still use the old claw movement, as it is much cheaper and easier to make than the Sprocket Intermittent.

The superiority of the Sprocket Intermittent movement is unquestioned throughout the motion picture industry. However, to those not familiar with the mechanics of projection, it may be said that the **claw** moves the film by an intermittent downward pull on the perforations, which, where the showings are continuous, as in theatres, soon breaks the perforations, causing loss of loops, jumpy pictures, wear and tear on the film, and on the mechanism itself, whereas the **Sprocket Intermittent** is a rotary movement, smooth and uniform always.

The silent models are built so as to be easily and quickly changed for sound.

DeVry Manufactures the Most Complete Line of Motion Picture Equipment in the World—including both 16 and 35 mm., silent projectors and cameras and 16 and 35 mm. Sound Cameras and Projectors in sizes for the largest theatres or small classrooms.

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EDUCATIONAL DIVISION

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1. **DICTAPHONE BUSINESS PRACTICE**
   Answers a definite and growing demand from progressive business men for competent Dictaphone secretaries. Leads to the better-salaried positions.

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   Where the use of the Dictaphone, accurately correlated with the textbook, shows a saving of 33⅓% in time—and still increases results 25%.

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   By Mrs. Letitia Raubicheck, Director of Speech Improvement, N. Y. City Board of Education, and Mrs. Mary Morris Seals, Barnard College, Columbia University. Aided by 20 full sized permanent practice records, this course is the Ultima Thule of Improved Speech.

These three courses are used with the new B-12 Dictaphone Transcribing Machine, equipped with "Nuphonic Reproduction," which sets a new standard for voice clarity.

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THE AMERICAN SCHOOL AND UNIVERSITY

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BRANCH OFFICES

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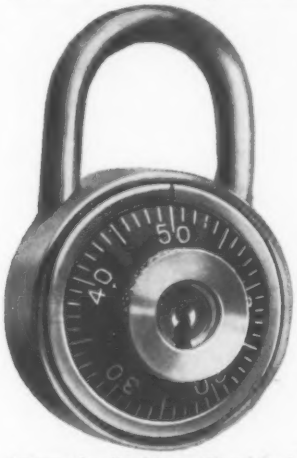
COMBINATION LOCKS

The maximum of economy and security.

Automatic Locking—Furnished either masterkeyed or not masterkeyed.

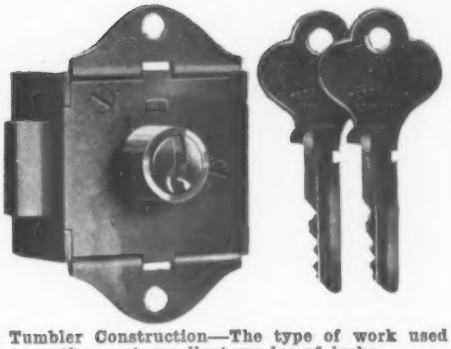


Automatic Locking—Furnished either masterkeyed or not masterkeyed.

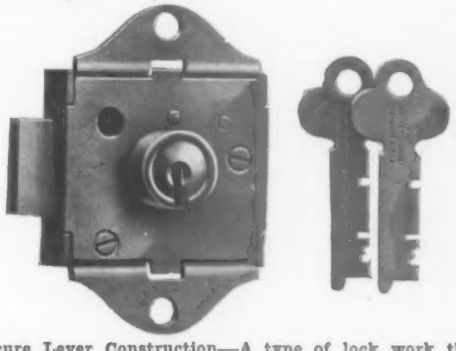
Automatic Locking—Not furnished masterkeyed.

MANUALLY OPERATED KEY LOCKS

For use where greatest efficiency is requisite.



Pin Tumbler Construction—The type of work used in the most excellent grades of locks.



Secure Lever Construction—A type of lock work that has proved its worth in years of service.

Even under difficult space and light conditions the simple and positive operation of inserting and turning a key reduces delay to a minimum.

THOMAS A. EDISON, INC.

Laboratory and General Offices: Orange, N. J.

Business Firms Today Want Secretaries with a Working Knowledge of EVERY Office Procedure!

Be Sure That YOUR Graduates Do These 3 Things Well--

- **File Efficiently**
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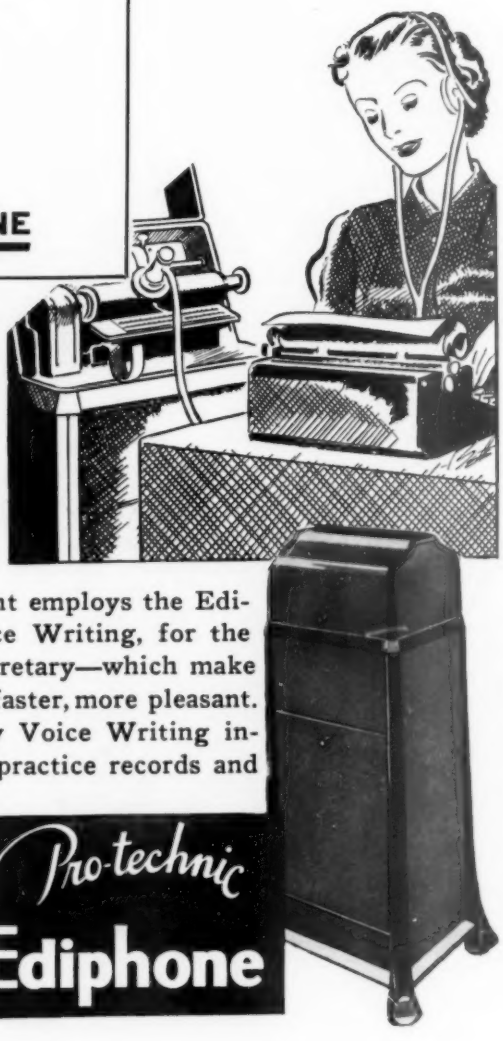

If your graduates specialize in one thing—so much the better. But with so many business firms still economizing, it is important that secretaries be equipped with a thorough working knowledge of all office appliances and procedure, including experience with Voice Writing! Ediphone Voice Writing Equipment employs the Edison principles of "Balanced" Voice Writing, for the dictator; and Typease, for the secretary—which make dictating and transcription easier, faster, more pleasant. To facilitate and further simplify Voice Writing instruction and learning, Ediphone practice records and other educational aids are supplied. For detailed information, telephone The Ediphone, Your City, or write to: Department of Educational Training, Ediphone Division.

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INCORPORATED

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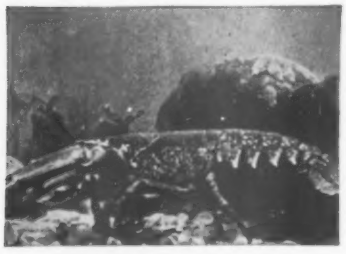
TESTS conducted in hundreds of classrooms by leading educators conclusively prove a substantial increase in learning for students who have the advantage of Erpi Educational Talking Pictures as classroom aids.

Eight series of these films are offered for purchase by schools as a permanent part of their teaching equipment, and many others are in preparation.

Erpi educational films have been carefully planned for integration with regular classroom work, each one being based on a unit of instruction.

Produced to meet high educational standards, these pictures bring to the classroom materials which can be readily presented only by this means.

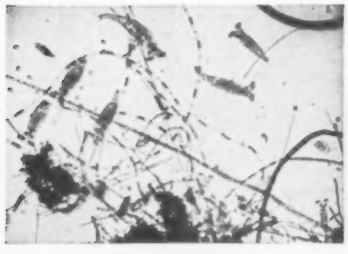
Expert service is available, without cost, to assist you in organizing your own program of Audio Visual Instruction. Your inquiry will receive immediate attenton.



ELEMENTARY SCIENCE

8 Series of Educational Talking Pictures made for classroom work in these courses:

GENERAL SCIENCE



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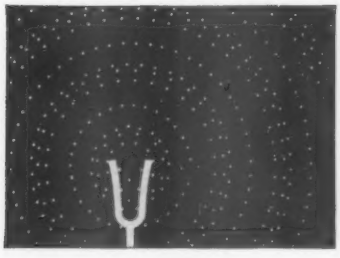

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EDUCATIONAL TALKING PICTURES

THE AMERICAN SCHOOL AND UNIVERSITY

ELECTRO-ACOUSTIC PRODUCTS CO.

SUBSIDIARY OF THE MAGNAVOX COMPANY

Fort Wayne, Indiana, U. S. A.

CENTRALIZED RADIO AND PUBLIC ADDRESS SYSTEMS FOR USE IN EDUCATIONAL INSTITUTIONS

THE latest developments in Centralized Radio and Public Address Systems are now available for use in small, medium or large educational buildings at costs well within prevailing budget limitations.

The newly developed Electro-Acoustic Systems Nos. 1, 2 and 3, specifically designed and constructed to meet the exacting requirements of educational buildings, are unexcelled for tone qualities, simplicity of operation, versatility and sturdiness of construction.

As indicated in the illustration, unsightly mechanical equipment has been concealed in a well-designed desk that completely houses all control units and power stages, and that will harmonize with any scheme of interior furnishings and decorations.

Everything is self-contained — radio, phonograph, room switch distribution system, control units and amplifiers. Extreme versatility of the distribution system permits relaying of radio and recorded programs as well as announcements to any pre-selected room or group of rooms or to the entire student body. Separate emergency control switch permitting interruption and immediate resumption of scheduled programs that are being relayed to one or more rooms whenever emergency announcements to entire student body are necessary is an exclusive feature. Optional equipment is available to include a very efficient return speech or supervisory unit providing facilities for two way conversation between the superintendent' office and any pre-selected room. This equipment will lower the cost of school administration while increasing its efficiency.

Exterior-Ramsey Junior High School, Minneapolis, Minn.

Central Control in Ramsey Junior High School, Minneapolis

The most compact central station unit obtainable. Desk is standard height, thus placing switches, microphone and control units within easy reach of operator when seated. Amplifiers are concealed in a special ventilated and insulated compartment. When not in operation, all control units and microphone can be completely covered and locked to prevent tampering by unauthorized persons. A dignified and highly efficient central control station.

Discriminating buyers are selecting Electro-Acoustic Systems because of their exceptional fidelity of reproduction and high degree of scientific development. The amplified voice retains all of its individual characteristics and inflections. Musical reproduction is noted for its fidelity to the original, from deepest bass to highest treble.

The excellence of Electro-Acoustic Systems is attested by many notable installations and our unusual guarantee reflects our confidence in their durability and satisfactory performance. The services of our Engineering Department are at your disposal without cost or obligation. Specifications and estimates will be furnished on request.

A FEW OUTSTANDING ELECTRO-ACOUSTIC INSTALLATIONS

Lake Forest Illinois H. S.
Ramsey Junior H. S., Minneapolis
Lorain Ohio High School
Walnut Hills School, Cincinnati
Leavenworth Central School, Wolcott, New York
Central School, South New Berlin, N. Y.
Jasper, Ind., High School
Franklin Square School, Hempstead, Long Island, N. Y.

GENERAL ELECTRIC COMPANY

General Office: Schenectady, New York

SALES OFFICES IN PRINCIPAL CITIES

Classroom Eyestrain—Its Heavy Cost

The up-to-date school executive or teacher is becoming increasingly eye-conscious. He is beginning to realize the heavy cost of eyestrain in the classroom. More and more he is appreciating the truth of these facts:

"The sense of sight is by far the most important medium by which pupils learn. In studying, a pupil's eyes take countless visual impressions or images. If the lighting and visual conditions are such that these images are taken rapidly and clearly, a lesson will be learned more quickly, and with less drain upon the child's resources.

"The direct result of this preventable backwardness is an economic waste, both through loss of the pupil's time, with the inevitable discouragement which follows failure, and through the additional expense to the school system.

"When through impaired vision students are deprived of the opportunity to acquire information that would be of use and value to them, or are compelled to spend additional months or years in school in order to repeat work in which they have failed, the individual, the community, and society in general suffer a heavy loss."

The above quotations are from "Standards of School Lighting, with Suggested Requirements for a School Lighting Code," a pamphlet prepared under the joint sponsorship of the Illuminated Engineering Society and the American Institute of Architects which should be in the hands of every school executive and school architect.

G-E PHOTOELECTRIC RELAY, CR7505-D4
For Indoor Light Control

What Are Schools Doing to Prevent Avoidable Eyestrain?

Two main factors are responsible for classroom eyestrain:

1. *Faulty vision.*
2. *Faulty lighting.*

A great majority of the schools in this country are making more or less adequate provision for examining the eyes of the pupils and prescribing glasses, where necessary, to correct faults of vision. But the matter of proper school lighting has been left largely to chance. True, windows have been provided, there has been some attempt to avoid glare by providing window shades, and usually pupils have been seated so as not to face the light. But very little expert attention has been given to providing the correct amount of light, properly diffused and distributed. Certain types of school activities require higher degrees of illumination than certain other types.

Guesswork Eliminated—General Electric Photoelectric Relays

How may a teacher know that the pupils are receiving the proper amount of light at any given time? There are two ways that can be depended upon:

1. *A photoelectric cell may be used to warn the teacher at the moment the illumination becomes insufficient.*
2. *Better yet, a General Electric Photoelectric Relay will actually turn the artificial light on or off, at certain stated foot candle standards.*

Is this General Electric Photoelectric Relay expensive? On the contrary, it is inexpensive, compared with the cost of poor illumination and impaired vision!

Then why are not these General Electric Photoelectric Relays in general use in the schools all over the country? Of course, the answer to this is that the idea is a comparatively new one. But just as electric refrigeration and air conditioning have advanced, and will continue to advance, so this other scientific invention for adding to the pupils' welfare and efficiency has been advancing in this year 1936, and will continue to advance in the years to come.

Write for Information on General Electric Photoelectric Relays

To those school executives or school architects who would be interested in the technical details of G-E Photoelectric Relays, we shall be glad to send a copy of our Booklets GEA 1654B and 1602. Or a G-E representative will be glad to discuss classroom requirements with you, advising the proper type to meet your needs.

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New York Chicago San Francisco Boston Toronto London Sydney

A Complete Office Practice Program

Practical Instructional Materials for Every Teaching Plan

For the Battery Plan

OFFICE MACHINE PRACTICE, by Dr. C. H. Katenkamp, Forest Park High School, Baltimore, Maryland. A series of five booklets designed to teach fundamental operation technique. A separate book for each machine. Largely self-instructing. The booklets include: No. 1, The Monroe Calculating Machine; No. 2, The Burroughs Calculator; No. 3, The Sundstrand Adding and Listing Machine; No. 4, The Dalton Adding Machine; No. 5, The Comptometer. List price of each booklet, 32¢.

APPLIED MACHINE CALCULATION, by George B. Kingsbury and Marjorie Smith, Hartford Public Schools, Hartford, Connecticut. Adapted for use with any type of calculating or adding machine—either listing or non-listing. Twenty lessons, frequent tests, and plenty of supplementary work. List price of text, 60¢; package of checks, 36¢.

For the Rotation Plan

OFFICE APPLIANCE EXERCISES, by J. T. A. Ely and A. C. Beaver, Washington School for Secretaries, Washington, D. C. Revised November 1, 1935. The purpose of this brief course is to familiarize the students with the most commonly used office machines which, from the teaching standpoint, may be divided into four groups: (1) accounting and record-keeping machines, (2) duplicating machines, (3) name- and data-writing machines, (4) miscellaneous labor-saving machines.

The teaching plan of this beginning text is simple and is based on the apprentice system of instruction. One pupil at a time receives instruction on each type of office machine. He, in turn, "breaks in" the next pupil before passing on to another machine. This plan of instruction follows the customary procedure in the business office—the expert operator "breaking in" the new operator. List price of text, $1.60.

For the Integrated Laboratory Plan

OFFICE PRACTICE — AN INTEGRATED LABORATORY PROJECT, by Rose A. Scholl and Albert Stern, Burroughs School for Operators, New York City, and Dr. Edward J. McNamara, Principal, High School of Commerce, New York City. The nearest approach to actual office procedure, and the most authoritative business practice course yet published for this plan of instruction.

This course presupposes a general knowledge of the functions of a business office and a reasonable amount of proficiency in the performance of various office skills. "Office Practice" calls for the functioning of these knowledges and skills in their natural relationship.

A finishing course for secondary school students, adapted to any and all types of office machines. May be used with or without equipment. Text in two parts. List price of each part, 80¢.

APPLIED SECRETARIAL PRACTICE and **LABORATORY MATERIALS, by Rupert P. SoRelle and John Robert Gregg.** A comprehensive course for beginners. The office-manual approach and treatment for learning secretarial practice. This is the method usually followed by large offices in teaching new employees. The Laboratory Materials, projects taken from business offices, present an attractive integration of the various duties of the office. This course represents a minimum of theory and a maximum of office experience. Used by thousands of schools—of all types—as the text for secretarial practice classes. List price of text, $1.40; Laboratory Materials, 60¢.

Write our nearest office for sample copies. A charge of $1.00 must be made for sample copies of Office Appliance Exercises, by Ely and Beaver, and 50¢ for each part of Office Practice—An Integrated Laboratory Project, by Scholl, Stern, and McNamara. These sample-copy prices include the Teacher's Manuals.

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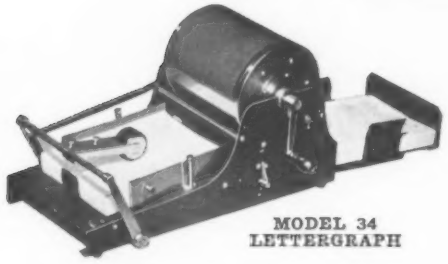


MODEL 34
LETTERGRAPH

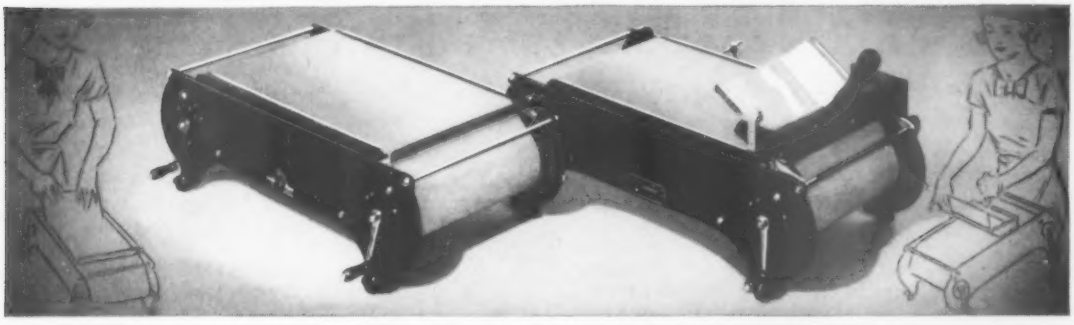
STENCIL DUPLICATORS

Heyer manufactures eleven stencil duplicators —six models of rotary Lettergraphs and five models of Flexographs. Prices range from $12.00 for the post card Flexograph to $90.00 for the automatically fed, automatically inked Model 34B Lettergraph which produces copies at speeds up to 120 per minute. From this line of eleven machines you can easily select a model that will economically fill your requirements. All are simply constructed and easy to operate. All are sold complete with supplies, ready to operate.

"Buy from Heyer," has been the key to worthwhile savings in duplicators and supplies for more than thirty-three years. Efficient school men have long realized that Heyer duplicators are dependable, that they will do all that higher priced duplicators will do. Investigate the Heyer Line—you will find low first cost, low depreciation and trouble-free performance.

Supplies for Stencil Duplicators

In the Heyer Line you will find a quality item for every stencil duplicator need. Whether you have a Lettergraph, Mimeograph, Rotospeed or some other duplicator you will be able to get maximum results at a saving by using Heyer Stencils, Inks, Correction Fluids, Styli, etc.



GELATIN DUPLICATORS

Look no further if you need a gelatin duplicator! For Heyer manufactures eighteen sizes and styles ranging from the post card Hektograph priced at $1.25 to the Super-Efficiency duplicator at $39.50. The Efficiency and Super-Efficiency illustrated above are used by thousands of schools daily. Let us know your requirements and we'll fit a machine to your needs. All are sold complete with supplies.

Supplies for Gelatin Duplicators

Gelatin Rolls, Films, Refill Composition, Hektograph Pencils, Inks, Typewriter Ribbons, Carbon Paper and all other supplies are found in the Heyer Line. All can be used on Heyer Ditto, Vivid, Graphic or any gelatin duplicator.

Hektograph Workbooks, Grades 1-8

Written and edited by widely acclaimed school people such as Delia E. Kibbe and feature superior contents. (Twenty books in all.)

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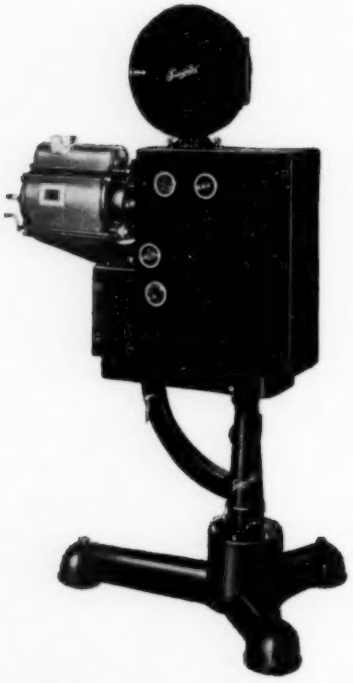
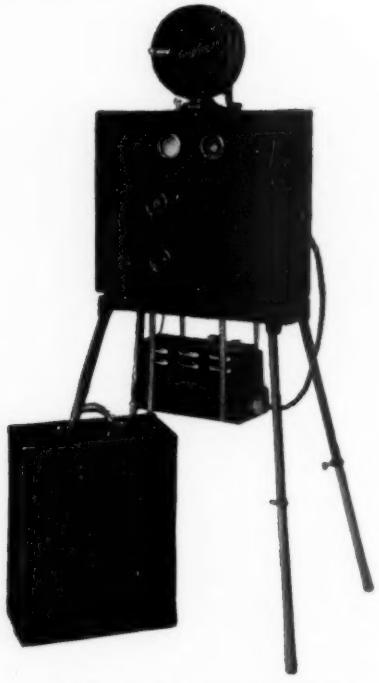


Simplex-Acme
SOUND PROJECTOR



Simplex PORTABLE
SOUND PROJECTOR

We are the oldest and largest manufacturers in the world of standard, professional motion picture equipment and the only makers of a complete line of 35 mm. motion picture projectors used in thousands of theatres throughout the world. Simplex Projectors and Simplex-Acme Sound Projectors are also used in a large number of universities, colleges, schools, churches and public institutions. Simplex Projectors meet the exacting requirements of government specifications as well as many great manufacturing companies.

Our wide experience enables us to understand the needs of the non-theatrical or educational field where, in many instances, there is no technical advisor to guide in the selection of equipment. The complete line of 35 mm. projectors we manufacture places us in a position to impartially advise regarding the kind of equipment best suited to each particular type of installation.

SIMPLEX PORTABLE SOUND PROJECTOR

For Universities, Colleges, Schools, Churches, etc.

SIMPLEX-ACME SOUND PROJECTOR

For Theatres and Auditoriums

SIMPLEX PROJECTORS

Adapted for Sound Equipment in Large Theatres

We will be pleased to send full information regarding any of our motion picture projectors and such inquiry involves no obligation whatever. We realize that the installation of motion picture equipment requires serious and long consideration and are, therefore, pleased to supply information for institutions with the full realization that decisions cannot be quickly made.

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EAST WING OF MILLER LINE PLANT

The relation of Miller Line history to the history of typewriting is so close that its separation would present a problem as intricate as unscrambling the chronological relativity of the hen and the egg.

From the simple typewriting needs of the nineties to the multitudinous writing machine requirements of 1936, the Miller Line has kept faith with the users of writing machines by providing a right ribbon for every writing requirement and a correct carbon for every copying condition as it developed. Witness: two of our 1935 developments, the CARDINAL and the MADAME BUTTERFLY typewriter ribbons mentioned below.

MILLER LINE INKED RIBBONS

Made regularly in all standard colors and standard color combinations, record or copying, and in seven different degrees of inking, for any machine requiring an inked ribbon:

ADDING MACHINE RIBBONS
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DATING MACHINE RIBBONS
HECTOGRAPH RIBBONS
LITHOGRAPH RIBBONS
MULTIGRAPH RIBBONS
PHOTOSTAT INKED RIBBONS
POLLARD ALLING RIBBONS
PURE SILK TYPEWRITER RIBBONS
SPEEDAUMAT RIBBONS
TABULATING MACHINE RIBBONS
TIME CLOCK RIBBONS
TIME STAMP RIBBONS
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Made in a complete variety of more than 700 grades, weights, and finishes, in all standard colors, and sizes, for any purpose where a carbon paper may be utilized:

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CARBON ROLLS
COPYING CARBON PAPER
ELLIOTT ADDRESSING MACHINE STENCIL CARBON ROLLS
ELLIOTT-FISHER ROLLS
HECTOGRAPH COPYING CARBON PAPER
PEN CARBON PAPER
PENCIL CARBON PAPER
TABULATING MACHINE CARBON
TALLY ROLLS (UNDERWOOD AND OTHER MACHINES)
TRACING CARBON PAPER
TYPEWRITING CARBON PAPER

TWO 1935 MILLER LINE DEVELOPMENTS

Our new CARDINAL typewriter ribbon is the crowning climax of four decades of superfine typewriter ribbon experience—in point of fabric—in point of ink formula—in point of painstaking production—in point of writing excellence. Get one from your Miller Line representative. We know you will like its beautiful work.

Our new MADAME BUTTERFLY guaranteed Pure Silk typewriter ribbon—another Miller Line pace maker developed during the past year—gives typewriter users an additional superfine ribbon. Its thin smooth pure silk fabric produces a writing perfectly even, uniform and superbly neat—"fine as silk."

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New Equipment Designed for Schools Only

OPERADIO, recognizing the importance of school sound systems in modern efficient school administration, has made a thorough one-year study of superintendents' and principals' requirements, and of their requirements alone.

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As a result of this study OPERADIO has determined that equipment of this nature must be designed particularly for schools and that equipment cannot be indiscriminately combined and then called a "school system."

OPERADIO is the first manufacturer to offer schools a complete line of school sound systems individually designed for the particular school in question, practically a custom-built system, at no higher cost than an ordinary system.

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OPERADIO offers more than just an amplifier. Its systems are always carefully matched from input to output to produce an overall new high in sound quality. All OPERADIO systems are of the "constant impedance" output type.

Provisions for All Known Inputs and for All Future Requirements

OPERADIO provides even in its smallest system facilities for radio, microphone, phonograph, signaling and other input devices and for the future duplication or addition of these devices.

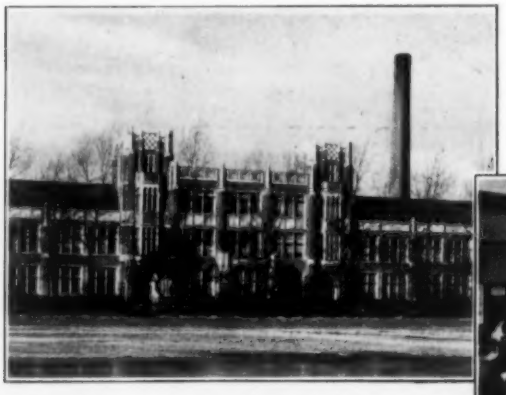
The systems are supplied in either the convention rack and panel or solid American Walnut desk or cabinet type.

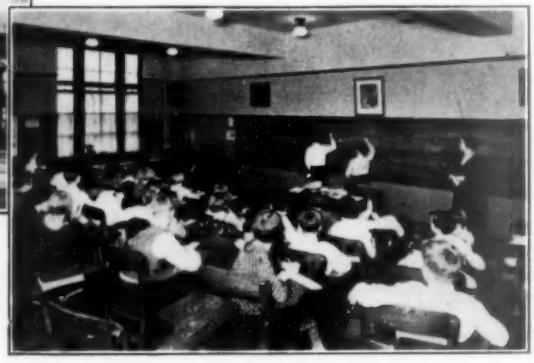
Guarantee

All OPERADIO equipment is unconditionally guaranteed and carries a definite service policy which actually provides expert service if and when needed.

Factory Survey

All OPERADIO installations are made from surveys of the actual school buildings themselves and from plans of the school buildings in question. The OPERADIO company has found that quite often this practice has enabled it to offer attractive and helpful suggestions with economical results in many cases.





Pictured here is the Hirsch Junior High School, one of the many modern schools equipped with OPERADIO equipment. The Speaker is mounted in the left hand corner of front wall of classroom in the picture to the right

SOCIETY FOR VISUAL EDUCATION

INCORPORATED

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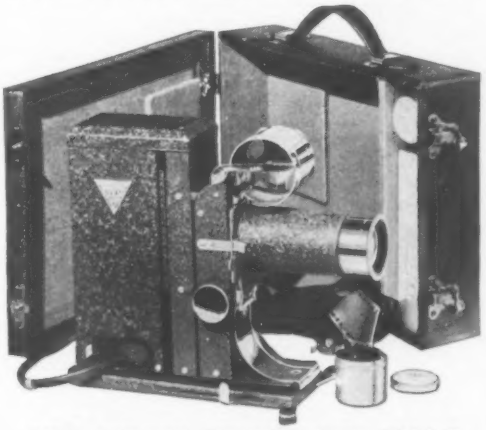
S.V.E. PICTUROL PROJECTORS

The Society for Visual Education, Inc., has been serving schools and industries since 1919, concentrating on the manufacture of S.V.E. Picturol Projectors (film stereopticons). Only through the Society or its distributors can you be assured of a complete line of Filmslide Projectors from which to choose the one best designed to meet your particular school requirements.

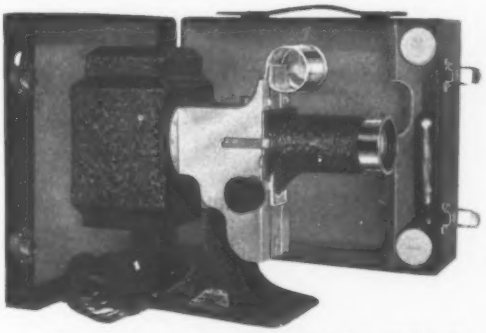
MODEL D

(Illustrated at right, below)

This handy, inexpensive S.V.E. Picturol Projector is enjoying growing popularity as a visual aid in the classrooms of the country. It has been in successful use for fifteen years by thousands of teachers who praise it for its convenience, portability and efficiency. The improved Model D, here illustrated, provides increased illumination, recessed film track, noiseless operation and extreme compactness, and is offered at the low price of only $38.50 complete with carrying case.



S.V.E. (200-watt) Picturol Projector Model F, with Carrying Case, $48.00



S.V.E. (200-watt) Picturol Projector Model D, with Carrying Case, $38.50

FILMSLIDE SUBJECTS

An extensive library of Picturol Filmslide subjects is available covering the following courses:

Archaeology
Ancient History
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Foreign Geography
Industrial Geography
Physical Geography
Health
Home Economics
Literature
Latin
French
Spanish
Music
Nature Study
Physical Education
Physics
Primary Reading
Safety
Travel
U. S. History

MODEL F

(Illustrated at left)

Model F Projector, the latest development in this field, is the only manually operated projector having a rear aperture glass releasing mechanism—a patented S.V.E. feature used successfully for a number of years in the S.V.E. Automatic Projector. This feature materially protects the emulsion of the film. The large film magazine will accommodate up to four hundred frames of film. Film track and magazine are nickel-plated and recessed throughout. The illumination is superior to that of any other 200-watt projector in this field—ideal for classroom use. Price, with carrying case, $48.

PROJECTION SCREENS

We carry a full line of beaded and aluminum-coated special projection screens for use on tables or for hanging on walls or tripods. These come in a number of sizes and in mountings to meet all requirements. Prices range from $5 up.

SPECIAL FILMSLIDES

Schools desiring to make their own films for special uses may have them produced by us on short strips of non-inflammable 35 mm. motion picture film on which any number of individual photographs, charts or title cards may be photographed in series, for projecting on S.V.E. Picturol Projectors.

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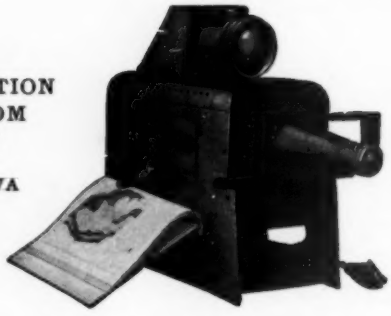
SPENCER COMBINATION CLASSROOM LANTERN

MODEL VA

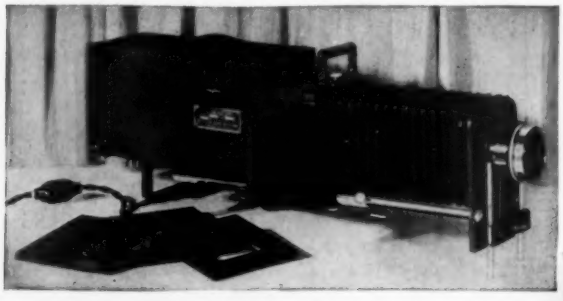


Spencer Model VA is designed for the projection of post-cards, photographs, drawings, etc., interchangeably with glass slides. The change from one to the other is instantaneous. By the addition of a Filmslide Attachment you may also use both filmslides and microscope slides, making this **a four-purpose lantern** at an unusually low price.

The Model V series was built especially to meet classroom conditions; consequently it is compact, portable, easily operated and truly efficient for daily class work. It permits the use of all available illustrations so that the teacher may economically develop his own library.

This model may also be had as an opaque projector only, at a price never before offered for such an outfit. This group is for direct projection on an opaque screen.

Another companion series—Model Y—will accommodate the same types of material but will project all illustrations in their proper position **through a translucent (DAYLIGHT) screen.** Prices are the same for either group.



COLOR PLATE PROJECTORS

Spencer Model DK was designed especially for protection of natural color plates and other valuable slides.

A motor-driven blower directs a blast of COOL air to the condenser chamber and to the slide, doing away with the objectionable water cell, heat-absorbing glass or other so-called method of eliminating heat.

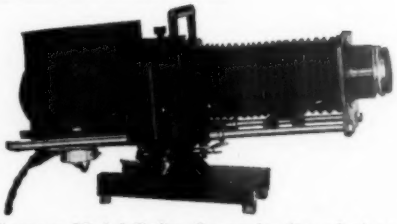
Model DK is easily portable, simply operated and insures marvelous screen results. Accommodates color plates from 4.5 x 6 cm. up to 3¼″ x 4¼″. An excellent outfit for use in classrooms, small lecture halls and the home.

Two larger outfits of this same general design are available for auditorium use and where the larger color plates are used. Model JK accommodates slides up to 4″ x 5″ and the Model LK up to 5″ x 7″.

LECTURE TABLE LANTERN

Spencer Model B—placed permanently on your lecture table permits the use of glass slides during any part of your lecture. Slides are placed on carrier right side up to the lecturer and are projected on a screen hung above and behind him, in plain view from any part of the room. By using a pencil as a pointer it too will be projected, thus indicating to the class the item under discussion. May be used without preliminary set up. Indispensable for class use. The Spencer Model B is efficient and inexpensive.

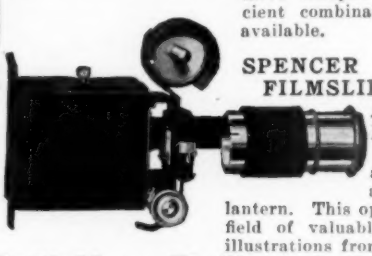
CLASSROOM LANTERN



Spencer Model D for the projection of glass slides in regular class work, embodies several special features incorporated in the design for the convenience of the teacher. It has non-heat conducting carrying handle; **double** tilting device for properly locating screen picture at any desired angle; reading aperture in side of lamphouse; special condensers and lamp insuring remarkably brilliant illumination.

May be used successfully on wall or blackboard as well as screen.

Addition of a Filmslide Attachment gives a three-purpose lantern in one projector. To change from glass to filmslides takes 18 seconds and from filmslides to micro-slides, 5 seconds. This provides the most inexpensive and efficient combination outfit available.



SPENCER FILMSLIDE ATTACHMENTS

May be adapted to any standard lantern. This opens up a new field of valuable educational illustrations from the Spencer Filmslide Library. Filmslides are the cheapest type of illustrative material but are pedagogically and photographically correct.

An exclusive Spencer feature on Filmslide Attachments is the arrangement for accommodating the 3″ x 1″ microscope slides interchangeably with the filmslides at no extra cost.

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"As Easy to Use as a Postage Stamp"

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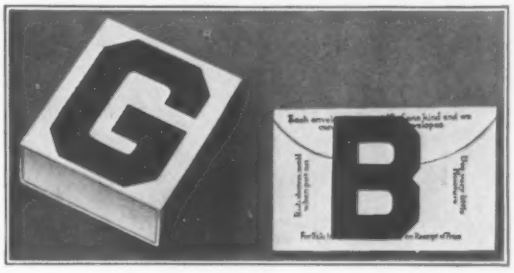
Willson's Gummed Paper Letters, Figures, Symbols and Tape are die-cut from best quality glazed, waterproof, gummed paper. They are easily applied and attractive in appearance.

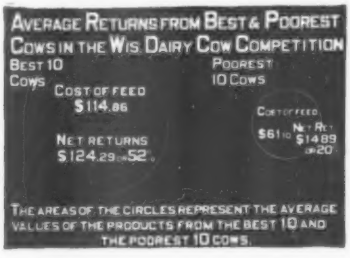


COLORS

Standard stock colors of letters and figures are white, black and red. Symbols and tape carried in white, red, black, blue, green, orange, silver, gold. Special colors cut on order.

STYLES

Three styles of letters and figures are available—Cheltenham, Block, and Gothic. These styles have been standardized because of their legibility and general acceptance as most desirable for display lettering. Sizes from ⅛-inch to 4 inches high.


AVERAGE RETURNS FROM BEST & POOREST COWS IN THE WIS. DAIRY COW COMPETITION
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COST OF FEED $114.86
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THE AREAS OF THE CIRCLES REPRESENT THE AVERAGE VALUES OF THE PRODUCTS FROM THE BEST 10 AND THE POOREST 10 COWS.

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Willson's Gummed Paper Letters, Figures, Symbols and Tape are especially adapted for making flash cards, analytical charts and graphs, signs, indexes, marking files, records, maps, etc. Used in every type of educational and administrative work.

PACKING

Letters and figures are packed 10 of one character to an envelope or 100 of a character to a box. Symbols are packed in boxes of 100 only. Assortments of 1,000, 2,000 or 5,000 characters are the convenient and economical method of purchase, the envelopes and boxes being purchased as refills for the handy assortment boxes as needed.

MENU RACKS

Willson's Gummed Paper Letters and Figures are used widely in school cafeterias, with our Ladder Menu Rack shown here, one of several types. Write for particulars on Cafeteria Sign Equipment.

Send for Free Samples. Generous envelope of Willson's Gummed Paper Letters and Figures, and our latest catalog, showing forty styles and sizes, sent on request.

OTHER PRODUCTS MANUFACTURED BY THE TABLET & TICKET CO. ARE

Changeable Class Schedules
Changeable Announcement Boards
Changeable Desk Signs
Changeable Door Plates
Cardboard Die-Cut Letters
Educational Puzzle Maps

TUTTLE & BAILEY, INCORPORATED

Manufacturers of

HART & HUTCHINSON LOCKERS

MAIN OFFICE AND PLANT

New Britain, Connecticut

New York Office: 101 Park Ave.
Philadelphia Office: 1600 Arch St.
Boston Office: 6 Beacon St.
Chicago Office: 61 W. Kinzie St.

REPRESENTATIVES IN OTHER PRINCIPAL CITIES

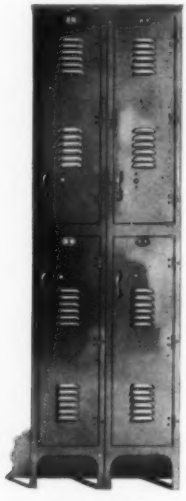
For over twenty years Hart & Hutchinson Lockers have been the standard of comparison for locker equipment in schools. The multitude of Hart & Hutchinson lockers now in use throughout the country bear silent witness to their long life and sturdiness.

As in the past, the construction is featured by the one piece frame and door, assuring an exact fit of the door into the frame. A superior latching device of the automatic gravity type is the latest improvement. It is of channel formation absolutely tamper proof and if desired, can be furnished with the pre-locking feature. All parts have been carefully designed to provide a rigid locker capable of withstanding the severest use.

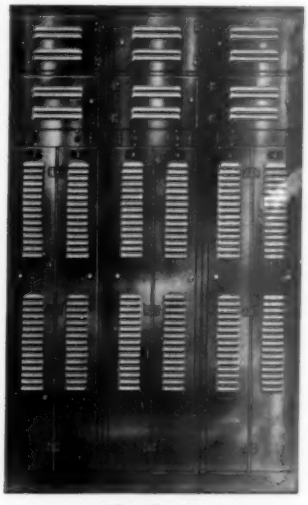
Hart & Hutchinson lockers can be furnished in all popular sizes and types, including: single, double and multiple tier constructions, Storites (the original two-person locker), and seven and eight compartment lockers; additional equipment covers basket racks and trucks, baskets, and key cabinets. Locks of any desired type can be furnished.

A complete catalogue covering all information on the Hart & Hutchinson line, as well as full data on recessed installations will be furnished on request.

Type BCG—Single Tier



Type BCG
Double Tier

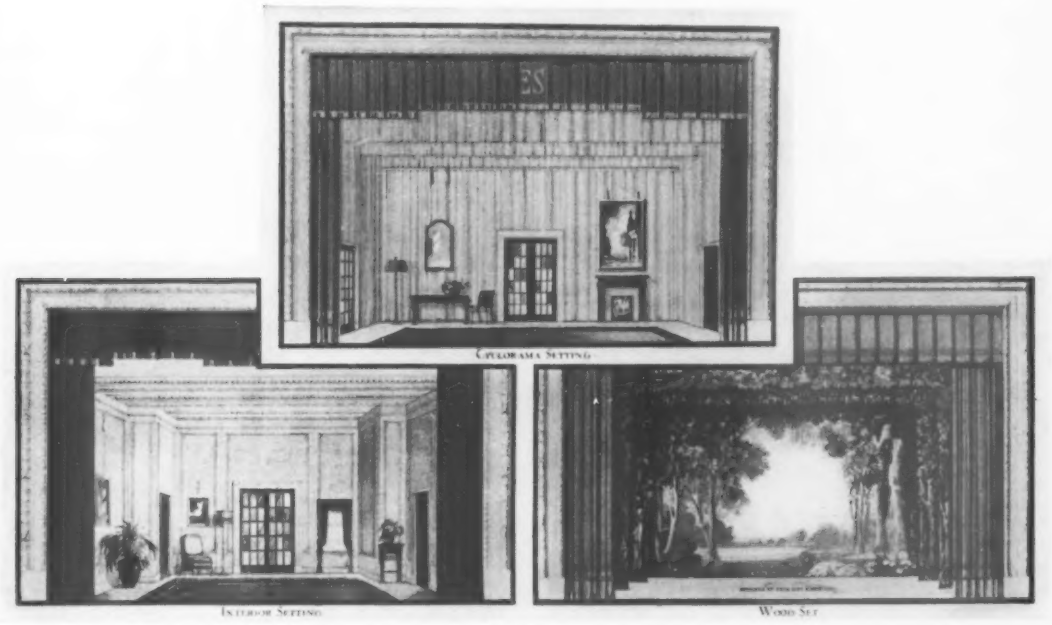


The Storite

TWIN CITY SCENIC COMPANY

Established 40 Years

1125 Chimes Bldg.	602 Marquette Bldg.	2819 Nicollet	4704 Pershing Ave.
Syracuse, N. Y.	Detroit, Mich.	Minneapolis, Minn.	Fort Worth, Texas



We Specialize in

Stage curtains, auditorium draperies, cyclorama settings, stage electrical equipment, lighting, rigging, hardware and curtain tracks.

Expert advice furnished for planning your stage and estimates submitted without charge.

Just check the items given below in which you are interested and call, or write, to our nearest office and we will be glad to give you complete information.

Curtains	Stage Equipment	Electrical
Stage Curtains	Scenery	Flood Lights
Window Curtains	Picture Screen	Footlights
Asbestos Curtains	Floor Cloth	Lighting Effects
Cyclorama Settings	Stage Properties	Spot Lights
Curtain Motor	Stage Rigging	Border Lights
Curtain Track	Stage Hardware	Olivettes
Window Tracks	Locking Rails	Curtain Controls

VOGEL-PETERSON CO., INC.

Manufacturers of Peterson Checkroom and Wardrobe Equipment

1811 North Lincoln Street, Chicago, Ill.

PRODUCTS

Peterson All-Steel Checkroom and Wardrobe Equipment for schools, auditoriums, theaters, etc.; consisting of Stationary and Portable Floor and Wall Racks; Overshoe, Umbrella and Baggage Racks; Racks for Gymnasiums; Bathhouse Checkrooms; and Costumers.

THE PETERSON ONE-CHECK CHECKING SYSTEM

Advantages—The Peterson One-Check Checking System increases speed, eliminates errors, and utilizes any given space to provide the greatest capacity. Coats, hats, packages, umbrellas, canes, overshoes, are taken care of quickly and accurately with the least possible expenditure of space or effort.

Height 6 ft. 7 in.; width 2 ft.

Floor Rack No. 2

3, 4, 5 and 6-ft. sections which interlock, thereby providing a rack of any required length.

Operation—Each coat goes on its own hanger, where it is held in shape. Each hat has its correspondingly numbered section above the hanger. Canes, umbrellas, rubbers, overshoes or luggage are disposed of with equal care by means of systematically numbered umbrella, overshoe and baggage racks. The pupil or patron is given one check, which identifies every item. Only the Peterson One-Check System offers this remarkable service.

Service — We will gladly submit to architects without charge blue prints indicating the most practical checkroom arrangements.

Catalog — Complete catalog describing the Peterson System and equipment will be sent on request.

Same applies to all racks. No. 1 Portable—Same as No. 2 with casters added. Wood and Steel panel end to match interior trim can be furnished when desired.

SPECIFICATIONS AND CONSTRUCTION DETAILS

Frames—End and intermediate frames are interchangeable. They are of two-post construction. Posts are No. 18 gauge 1½ in. square tubular steel. Cross arm shelf supports are No. 15 gauge channel-formed steel to receive ends of shelving. Bases—No. 14 gauge 2½ ins. x 1 in. x 2 ft. ¾ in. enclosed top and four sides, with reinforced welded corners. Bases also equipped with vacuum-cup rubber shoes, eliminating necessity for anchoring. All joints electrically welded.

Shelving—New style dust-free perforated and embossed one-piece steel shelving having ⅝ x ¾ x ⅛-in. hard steel angle reinforcement. Also to this is added a ½-in. steel channel for number strips. Hat dividers at 1-ft. intervals embossed into shelving. Hat spacers have rear as well as side divisions. Coat hanger rail supported independent of shelving, thereby causing no undue strain to that portion of rack.

Wall Brackets—Similar in construction to end frames except having No. 3 gauge back supporting member. All connections electrically welded.

Throughout entire construction of all parts, there are no welded joints that will receive a shearing strain.

Capacity—8 coats and 8 hats per lineal foot of floor type rack. 4 coats and 4 hats per lineal foot of wall type rack.

Hangers — One-piece hardwood hanger. No. 10 hard steel rustless wire. Auxiliary hook below.

Numbering — Large, clear, and legible numeral impressed into white fibreloid.

Hardware — All hardware cadmium plated.

Shakeproof washers for all bolted connections.

Finish — Two coats mahogany-walnut brown enamel. Any other color by request.

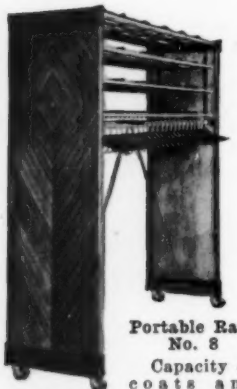
All equipment furnished complete ready for use.

Peterson Checking System is fully protected by U. S. Patent.

Rack No. 3U

The only wardrobe rack that combines space for unbrellas and overshoes as well as coats and hats.

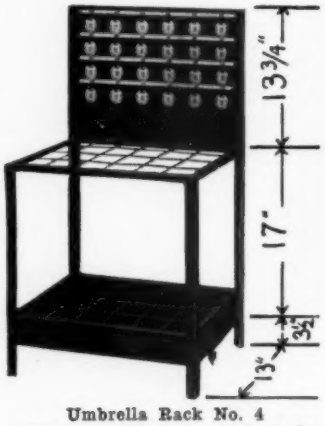
Splendid wardrobe for classrooms and offices. Height, 6 ft. 7 in.; depth, 1 ft. 4 in.; length, 4 ft. 2¾ in. Furnished with or without casters. Interlocking sections of any length can be supplied.



Length 6 ft.; width 2 ft.; height 6 ft. 9 in.

Portable Rack No. 8

Capacity 48 coats and hats; panel ends in walnut, mahogany or oak.



Umbrella Rack No. 4

Height, 34¼ in.; width, 1 ft.; length, 1 ft. and up. Capacity, 16 umbrellas to each 1 ft. length. Drip pan has pet cock for draining.

Overshoe Rack No. 7

Compartments 6 x 6 x 13 in. Standard height 3 ft. 3 in. Any width required. Usually made to fit under counter, or can be used as counter.

GRADE AND HIGH SCHOOLS AS WELL AS MANY OF THE LARGE UNIVERSITIES ARE USERS OF PETERSON CHECKROOM EQUIPMENT

WESTON ELECTRICAL INSTRUMENT CORP.

601 Frelinghuysen Avenue, Newark, N. J.

ENGINEERING AND SALES OFFICES

Albany	Cleveland	Jacksonville	Minneapolis	Pittsburgh
Atlanta	Dallas	Kansas City	Newark, N. J.	Rochester
Boston	Denver	Knoxville	New Orleans	St. Louis
Buffalo	Detroit	Los Angeles	New York	San Francisco
Chicago	Honolulu, T. H.	Meriden, Conn.	Philadelphia	Seattle
Cincinnati				Syracuse

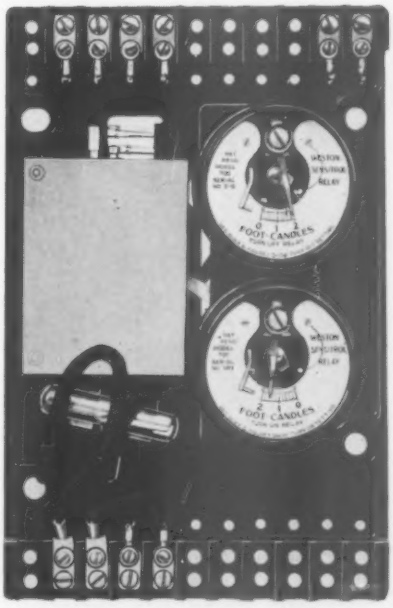
Schools now insure *proper illumination* at all times... with WESTON AUTOMATIC ILLUMINATION CONTROL RELAYS

Class-work improved— Eyestrain banished— with this proved automatic control

Schools, everywhere, are adopting automatic control of classroom illumination because tests have proved conclusively that where classroom lighting is automatically maintained at proper seeing levels, a very definite increase in educational efficiency is achieved.

For example; in a school at Tuscumbia, Alabama, the number of failures was reduced by over 60% in classrooms where the lighting was maintained above 12 foot candles at all times and in every section of the room. Similarly, in a school at Mt. Lebanon, Pa., students in classrooms having automatically controlled lighting showed approximately 28% improvement over students in classrooms without automatic control.

You can duplicate these results in your school with the simple, inexpensive Weston Illumination Control Relay. It automatically turns the classroom lights on before daylight recedes to a level which is insufficient for comfortable reading and study . . . whether at afternoon or during stormy days. When the storm passes, however, and nature's light is restored to the proper level, the lights automatically turn off.



THE WESTON PHOTRONIC AUTOMATIC ILLUMINATION CONTROL RELAY

The Weston Illumination Control Relay is inexpensive, simple to install, costs practically nothing to operate and requires no attention of any kind. Complete information will gladly be sent on request.

WRIGHT-DeCOSTER, INC.

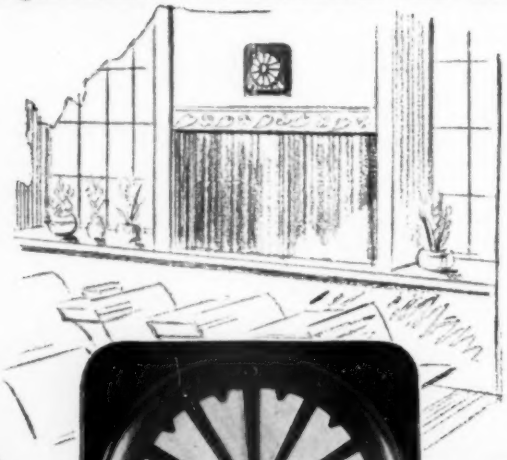
MAIN OFFICE AND FACTORIES
St. Paul, Minn.

Export Department
The M. SIMONS & SON CO., New York
Cable Address: "Simontrice"

Canadian Office
The A. M. FLECHTHEIM & CO.
Guelph, Ontario

WRIGHT-DeCOSTER SOUND REPRODUCERS
STANDARD EQUIPMENT *for* SCHOOLS *and* UNIVERSITIES

It Costs No More to Have the Best



Assure Your Pupils Constant Clear Distinct Reproduction

MODEL 750
METAL CABINET

MODELS 910 AND 920
FLUSH AND SURFACE WALL
MOUNTING CABINETS

"CABINETTE"

Cabinets Come Complete with Hyflux Magnetic
or NOKOIL Permanent Magnet REPRODUCERS

- CLASS ROOMS
- AUDITORIUMS
- STADIUMS

- DEPENDABLE
- POWERFUL
- WEATHER PROOF

MODEL 5000
STADIUM HORN

PLAY SAFE **and Insist on WRIGHT-DeCOSTER Reproducers**
Write for Catalog and Literature

THE AMERICAN SCHOOL AND UNIVERSITY

THE YALE & TOWNE MFG. CO.

TRADE YALE MARK Stamford, Conn. TRADE YALE MARK

INTRODUCE true economies, maximum security and increased efficiency in locker rooms with these Yale Combination Locker Locks. They supply a degree of protection heretofore unavailable in locks of this type for locker use; security which discourages temptation, aiding in character development. Large easily read dials simplify operation, and minimize congestion and delay in locker rooms.

FOR ALL MAKES AND ALL TYPES OF STEEL LOCKERS

FOR NEW LOCKERS AND FOR REPLACEMENT OF WORN OUT LOCKS ON OLD EQUIPMENT

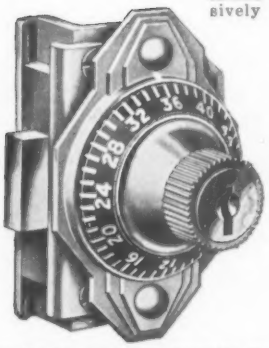
Exclusive Yale Features:

Maximum Security: Combinations dialed on three positive numbers. Combination must be known and cannot be located by manipulating dial.

Combination Disperser automatically upsets combination as lock is locked. A double safeguard. Acts as a defense against tampering.

Combination Changeable with every change of locker occupant—without removing lock from door. Feature secluded in back of lock in same secure manner as in Yale Bank Locks.

Supervisory Control of a group of lockers or the collective groups of a city school system obtained by the **Yale Master-Key Controlled Dial.** The master-key used is assigned exclusively to these locks.



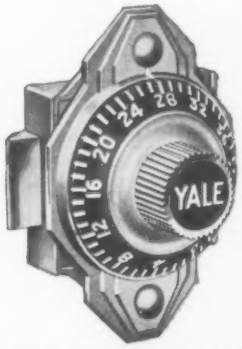
For Lockers with Automatic Bolt Release Mechanism. Automatic Self-Locking Vertical Sliding Bolt. A New Locking Principle.

Master-Key Controlled Dial

No. L337½-CM, Cadmium finish
No. L337½-DZ, Chromium finish

Dial Operated Only

No. L336½-CM, Cadmium finish
No. L336½-DZ, Chromium finish



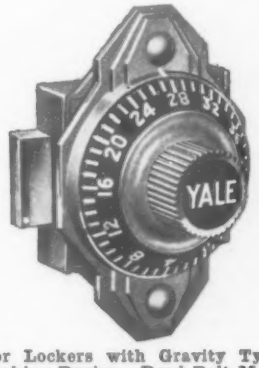
For Steel Compartment and Box Type Lockers. Beveled Springbolt, Automatic Self-Locking.

Dial Operated Only

No. L3369-CM, Cadmium finish
No. L3369-DZ, Chromium finish

Master-Key Controlled Dial

No. L3379-CM, Cadmium finish
No. L3379-DZ, Chromium finish



For Lockers with Gravity Type Locking Device. Dead Bolt Manually Operated.

Dial Operated Only

No. L3368-CM, Cadmium finish
No. L3368-DZ, Chromium finish

Master-Key Controlled Dial

No. L3378-CM, Cadmium finish
No. L3378-DZ, Chromium finish

NEW YALE COMBINATION PADLOCKS

For Basket Lockers and All Other Types and Makes of Steel Lockers

The finest and most secure combination padlocks yet produced

No. 589
Master-Key Controlled Dial

Same features of maximum security and automatic combination dispenser as the above built-in type.

No. 659 Emergency keyway in dial knob provides supervisory control of lockers. May be used with any of the above built-in types. ¼″ diameter steel shackle, bolted at both ends (heel and toe) when locked. Combinations unlimited.

No. 429 Dial operated only. A highly secure medium priced padlock. 9/32″ diameter steel shackle. Same secure features as No. 659 except Emergency keyway. Combinations unlimited.

Both padlocks have Yale Visible Rotating Dial with forty-eight white graduations and numerals contrastingly indented upon black enamelled dial. Simplified operation. Faster, more accurate dialing.

No. 429
Dial Operated Only

Section VII

CAFETERIA—HOME ECONOMICS—DORMITORY

Operation of the Buffalo Public School Cafeterias

BY SAMUEL PFEIFFER

SUPERVISOR, BUREAU OF CAFETERIAS, BOARD OF EDUCATION, BUFFALO, N. Y.

THE aim of the Cafeteria Department in the Buffalo Public Schools is to make available to school children warm lunches of maximum nutritive value, carefully prepared under sanitary conditions and dispensed in a sanitary manner at a minimum cost per service; to develop upon the part of the students intelligent discrimination in selecting foods, thus making for the formation of good habits of diet. The Department serves as an educational and social factor cultivating a spirit of friendliness, courtesy and democracy between teachers and children and among children themselves. In addition, the cafeteria system offers an approach to solving the problem of malnutrition by providing hot, nourishing meals to indigent and undernourished children.

At present the Cafeteria Department operates in 10 senior high schools, 5 vocational high schools and 48 elementary schools, making a total of 63 units. A Supervisor of Cafeterias directly responsible to the Superintendent of Schools, two Assistant Supervisors, one bookkeeper, one secretary and one clerk complete the personnel in the administrative office. The Department also maintains 17 trained dietitians, 50 unit managers and 170 cooks, assistant cooks, helpers and porters who are employed in the lunchroom kitchens. All salaries are paid from the cafeteria receipts. The Cafeteria Department is self-supporting, with the exception that the Board of Education supplies space, original equipment, heat and light. All food supplies, replacement and repairs, office supplies and the salaries of all employees, are paid from the cafeteria funds.

Buffalo's system is a centralized system. All food, equipment and supplies are purchased, all books are kept, and all employment is handled, by the central office.

Centralized control results in the standardization of many phases of cafeteria management. In Buffalo, the following plan of procedure has been formulated:

1. A complete system of records cares for the details involved in cost accounting. Daily report sheets showing expenditures and receipts and accompanied by signed delivery slips for items listed thereon, are sent to the main office. A daily, monthly and yearly total is made for each school. This is a complete record of every item of expenditure for every school.

2. A uniform wage scale for all employees has been set up by this Department. The salary schedule for cooks, assistant cooks, helpers and porters is computed on an hourly basis, an eight-hour day being the maximum number of hours allowed.

3. Inventories, taken in each school on the last day of the month and sent to the central office, are figured monthly at current prices.

4. Bi-monthly cash and sales reports are received and filed in the office of the Department of Cafeterias.

5. Selling prices of food in each school are uniform throughout the system, prices having been set by the central office at the beginning of each school term.

6. Specification sheets for canned goods and staple groceries are sent each month to local

FACULTY DINING ROOM IN THE BURGARD VOCATIONAL HIGH SCHOOL, BUFFALO, N. Y.

KITCHEN OF THE BURGARD VOCATIONAL HIGH SCHOOL, BUFFALO

Though the importance of business methods as applied to the operation of a school cafeteria is conceded, the fundamental aim underlying this phase of educational work is the conservation of health. In carrying out this objective in the Buffalo school cafeterias, the Department has set up and rigidly enforced the same standards of sanitation that are maintained in our outstanding eating houses.

1. Food inspectors, who are the employees of the Department of Health, periodically inspect the cafeterias. All employees are required to have a physical examination semi-annually and must be certified to by the Board of Health for the work of handling food.

2. Raw food materials are very carefully selected and any merchandise which does not answer to the specifications or is handled or delivered in an unsanitary manner is cause for its return and

firms for prices on the articles specified and purchased monthly. This insures a high and uniform standard of quality.

7. Weekly bids for butter, eggs, cheese, hams, etc., are received by the central office and the placing of orders is determined by quality and price.

8. Meat dealers and greengrocers are assigned to serve the various units. Daily orders for these commodities are placed by the unit managers.

9. From the lowest bid, in keeping with a high standard of quality, a uniform cost price has been set up for ice cream, bread and rolls, milk and cream, crackers and cookies. With the exception of bread, rolls and milk, orders for which are placed directly with the assigned dealer by the unit manager, the central office issues all weekly orders.

10. There is a definite policy regarding the sale of candy in the schools and a carefully selected candy list is controlled by this office. Candy requests, submitted by the managers, are filled weekly.

11. A uniform price for laundry has been established with the various laundry companies.

12. Soap, paper goods and straws are purchased on bid and are distributed from the warehouse of the Department of Education.

SUMMARY OF OPERATING COSTS

Food	60.0%
Service	30.0%
Supervision	3.5%
Replacement	2.0%
Repairs	2.0%
Paper goods and cleaning material	1.0%
Profit	1.5%
	100.0%

BOARD OF EDUCATION -- CITY OF BUFFALO

BUREAU OF CAFETERIAS

Cash and Sales Report

School ..... Date from ..... To .....

Day	Date	Cash Sales	Cash Short	Cash Over	Net Cash	Home Economics	Tickets Used		Candy Sales	Total Number Served
Total										

CHARGE SALES			PAYMENTS ON CHARGE SALES		
Date	Item	Amount	Date	Item	Amount
Total			Total		

REMARKS:

NOTE: This report is to be filed semi-monthly covering 1st to 15th inclusive for first half and 16th through remainder of month for second half of month.

Manage

BI-MONTHLY CASH AND SALES REPORT BLANK (made out in duplicate)

BOARD OF EDUCATION – CITY OF BUFFALO
BUREAU OF CAFETERIAS
DAILY REPORT OF MATERIALS AND SERVICES RECEIVED

School _____ Day _____ Date _____

DEALER	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT		CODE

(SEE REVERSE SIDE)

DAILY REPORT SHEETS (made out in duplicate), TO WHICH ARE ATTACHED THE SIGNED DELIVERY SLIPS FOR SUPPLIES RECEIVED

the cancellation of future contracts with the same source.

3. Dairies are inspected, and ratings on the per cent of butter fat are obtained from the Board of Health before milk orders are assigned to the various distributors. The opening of a milk account is determined largely by the recommendation of the health authorities of the municipality.

4. The selection of food at the counter is made and handled by the purchaser only. All sandwiches are enclosed in glassine bags.

As an educational organization the school cafeteria system has an excellent opportunity to assist in teaching the children better health measures. There are many methods by which this may be accomplished:

1. In the arrangement of food on the counters, milk, soup and vegetables take precedence over desserts and candy. Children pass the steam counter first, then milk, salads and desserts. Through the kindly guidance of the teacher or cafeteria manager, the children's choice is directed to the hot food rather than to the dessert.

2. Not unmindful of the need of sugar in the diet of boys and girls, sweets are offered through the medium of puddings, ice cream and fruits, either dried, canned or fresh. Candy is sold to pupils only after an adequate luncheon is selected.

3. In order that children may have variety, menus are changed daily. Monthly menus, covering a period of twenty days, are set up by the central office. Each unit manager receives a new set of menus each month. While the menus are more or less standardized, their use is flexible enough to allow the manager to adapt them to her particular unit, so that racial and group differences are considered at all times.

For several years, the Department of Cafeterias has conducted a class in cafeteria cookery and management for the purpose of training present and future employees. Menu planning, food preparation and serving, marketing and the merchandising of food are listed in the twenty lessons offered in this course. A very practical result of this project is the "Book of Tested Recipes" recently published by the Department and used as a standard cookbook in all units. Thus the same amount and quality of food for the same expenditure of money is insured to all patrons throughout the system.

This brief review of cafeteria procedure in the Buffalo Public Schools endeavors to show that the service functions as a part of the educational

No. Served _____ Amount _____

No Tickets Rec'd. _____ Amount _____

Total No. Served _____ Total _____

Today's Payroll—No. of Employees _____ Amount _____

Menu. No. _____

Today's Weather: _____

Today's Remarks: _____

INSTRUCTIONS This report must be completed and mailed to the General Office at the close of business each operating day. Entry must be made on the face of the report showing all merchandise received during the day; also, for all services such as repairs. Above will be shown the number served and the total sales for the day. These figures should be the same as shown by the Cash and Sales report for the corresponding day. The number of employees and the amount of payroll will also be shown each day. Weather conditions will be noted by the Unit Manager in space provided above. Under Remarks the Unit Manager will note special events, such as special assemblies, that effect the business of the unit.

I HEREBY CERTIFY that the foregoing is a complete record of the materials and services received at this cafeteria on the date shown, with the exception of petty cash purchases.

_____
UNIT MANAGER

BACK OF REPORT FORM SHOWN ABOVE

BOARD OF EDUCATION—BUREAU OF CAFETERIAS

MENUS FOR PUPILS AND TEACHERS

ELEMENTARY SCHOOLS

Six days in April, 1935

Numbers on left-hand margin refer to the page in cookbook on which recipe may be found.

No. 1

		Pupils	Teachers
P. 26	Vegetable chowder	$.03	$.05
" 47	Spanish rice	.05	.08
	Buttered green string beans	.04	.05
" 100	Shrimp & pineapple salad	.07	.12
" 93	Prune & cheese salad	.07	.10
" 82	Sliced ham sandwich	.05	.07
" 81	Peanut butter & celery sandwich	.05	.07
" 122	Chocolate blanc mange	.04	.05
	Stewed fruit	.04	.05

No. 2

P. 29	Corn chowder	.03	.05
" 52	Meat patties	.06	.10
" 45	Mashed potatoes & gravy	.03	.05
	Stewed tomatoes & celery	.04	.05
" 112	Cabbage, green pepper & celery salad—cooked dressing	.06	.10
" 92	Peach & cream cheese salad	.07	.10
	Favorite sandwich	.05	.07
	Ice cream	.05	.06
	Canned fruit	.05	.06

No. 3

P. 31	Lima bean soup	.03	.05
" 43 " 45	Vegetable plate { potatoes au gratin, glazed carrot strips, buttered beets	.08	.10

NOTE: To sell vegetables as separate orders—see price list.

P. 90	Apricot & cocoanut salad	.07	.10
" 94	Asparagus & egg salad	.06	.10
" 82	Ham sandwiches	.05	.07
" 147	Fruited jello	.04	.05
	Banana pie	.05	.06
	Stewed fruit	.04	.05

No. 4

		Pupils	Teachers
P. 32	Celery & tomato purée	$.03	$.05
" 57	Spanish veal	.08	.12
" 45	Escalloped potatoes	.03	.05
	Buttered peas	.04	.05
	Pineapple salad	.07	.10
" 113	Lettuce salad—red dressing	.06	.10
" 79	Cream cheese & pimento sandwich	.05	.07
" 82	Minced ham sandwich	.05	.07
	Stewed apricots	.04	.05
" 142	Home-made molasses cookies	.01	.01

No. 5

P. 33	Split pea soup	.03	.05
" 36	Creamed eggs a la King	.05	.08
	Spinach	.04	.05
	Orange & grapefruit salad	.07	.10
" 96	Potato salad	.06	.10
" 18	Plain muffins	.02	.02
" 82	Ham sandwiches	.05	.07
" 129	Date-nut butterscotch pudding	.04	.05
	Fruit—see price list		

No. 6

P. 27	Cream of celery soup	.03	.05
" 61	Italian macaroni with meat sauce	.05	.08
" 92	Peach & nut surprise salad	.07	.10
" 95	Combination vegetable salad	.06	.10
" 82	Sliced ham sandwich	.05	.07
	Cream cheese & jelly sandwich	.05	.07
" 120	Fruit cup	.04	.05
" 136	Home-made cup cakes (standard cake)	.03	.03
	Stewed fruit	.04	.05

and health program, that the problems of management and supervision are many and varied, and that the principles which underlie the operation of any business enterprise must be understood and intelligently applied if success is to result.

A Plan for a One-Room Home-Making Department

Used in Some Kentucky High Schools

BY ATA LEE

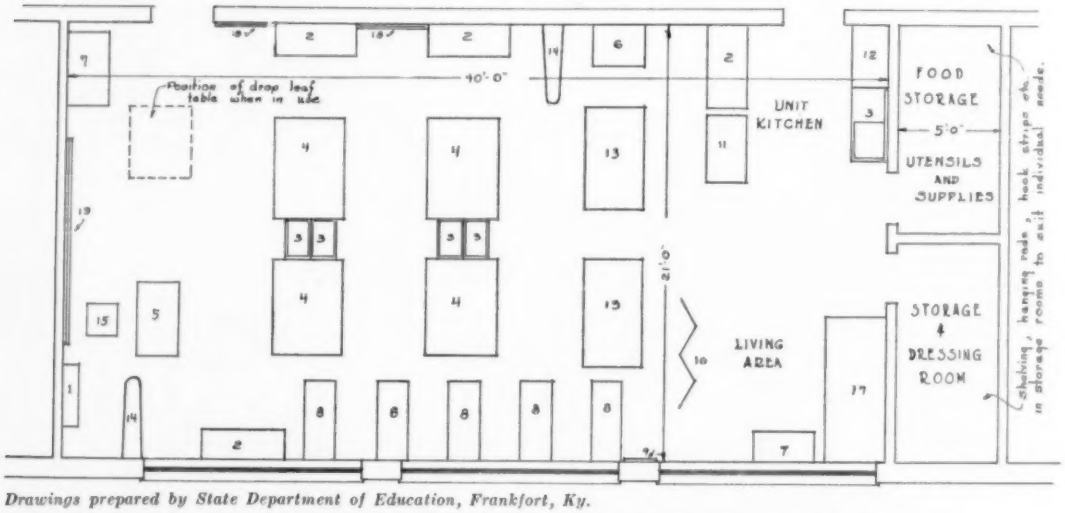
SUPERVISOR, HOME ECONOMICS EDUCATION, STATE DEPARTMENT OF EDUCATION, FRANKFORT, KY.

HOME-MAKING departments in secondary schools may fall into three classes—the one-room type, the two-room type, and the department having more than two rooms, as the cottage and apartment. The extension of home-making courses into the small-town high school and the rural high school has presented the problem of equipping a home-making department that will serve many purposes. It must occupy a minimum amount of space, yet adequately accommodate home-making classes and provide sufficient storage. It is desirable to select and arrange the equipment so as to provide surroundings and working conditions to approximate those of the home. And, too, we must have equipment that will efficiently care for classes from 16 to 24 pupils and sometimes more.

The following discussion will be confined to the consideration of a one-room department.

The one-room home-making department, with adequate storage space, seems to be the most satisfactory arrangement for the small school. It is doubtful whether we can justify the use of more space in these schools where funds are limited and the demands for the entire school are many. Often the home-making department has to be used for other classes, and the home economics teacher often teaches classes other than home-making. This factor will influence the arrangement of equipment. It sometimes necessitates a more formal arrangement in order to seat large classes for discussion. The formal arrangement of tables or desks so that the pupils will face a blackboard necessarily limits the possibility of giving a home-making department a home atmosphere.

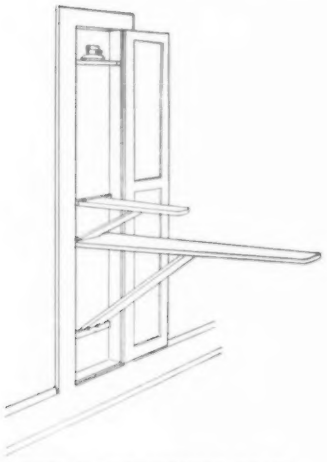
In equipping a one-room department used for many different purposes, we find that some sacrifices as to convenience and appearance have to be made. Just as the home-maker has personal preferences in the selection and arrangement of the furnishings of her home, so do home economics teachers have personal preferences when equipping a home-making laboratory. Some movable equipment is desirable because: (1) it will enable the rearrangement of the room for the purpose for which it is to be used; (2) it provides opportunity for the pupil to study different arrangements of equipment; (3) and it enables the teacher to rearrange equipment for classes of different size so as to give a more desirable working space.



Drawings prepared by State Department of Education, Frankfort, Ky.

ONE-ROOM HOME ECONOMICS DEPARTMENT, WITH STORAGE SPACE

1. Bookcase
2. Stove
3. Sink
4. Unit desk
5. Teacher's desk
6. Refrigerator
7. Drop-leaf table
8. Sewing machine
9. Mirror
10. Screen
11. Cabinet
12. Work table
13. Table
14. Ironing board
15. Chair
17. Day bed
18. Bulletin board
19. Blackboard



DESIGN FOR IRONING BOARD

Materials: boards, white pine; cabinet and braces, yellow pine

Floor Plan for Arrangement of One Room

The floor plan of a type of one-room department used in Kentucky may at first appear very formal in arrangement. In one end of this room, which is 21 x 40 feet, is a unit kitchen and space for a combination living room and dining room. This room will accommodate 20 pupils in home-making and at least 30 pupils in classes other than home-making.

Unit Desks.—Unit desks are used because they serve a number of purposes. They provide seating space during class discussions, cutting space for clothing, work space for foods, and storage space for food equipment. Each desk provides a work center for four girls. An 18-inch drop leaf may be added to one end of the desk so as to lengthen it when cutting garments. The unit desk gives a schoolroom effect rather than a homelike appearance, yet no other type of work table or cabinet has been planned which serves so many different purposes. The fact that it is used for both sitting and standing work makes it difficult to determine the most desirable height. The tendency has been to compromise between a good sitting and standing height and to use blocks to raise it.

Tables.—The two drop-leaf tables and the two larger tables (No. 13) provide accommodations for meal service in family-size groups. These are placed so that they are accessible to the groups at the different work centers. The two larger tables may be used for seating space during class discussion and for cutting space for clothing classes.

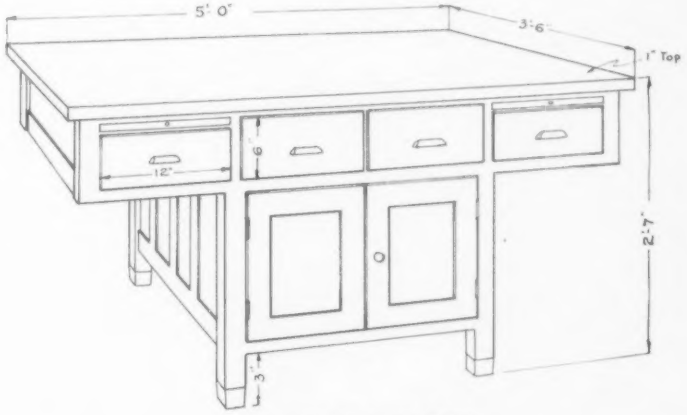
Stoves.—The stoves are arranged so that there is one accessible to each work center. The fuel practical in the community where the department is installed is recommended. Kerosene, gas or electricity may be used. When practical, a chimney may be provided for at least one coal or wood range in addition to the other type stoves.

Machines.—The sewing machines are placed ready for use. When the pupil is seated, the light will fall over the left shoulder. The machines may be moved into one of the storage closets when they are not in use for a period of time and the space is needed for another arrangement.

Ironing Boards.—Two ironing boards, of the folding type, are placed on opposite sides of the room so as to prevent congestion when they are in use. The board is supported by a brace from the wall. This type of brace enables one to slip a garment over the board, while the board supported by a brace from the floor will not permit this. Other desirable features are the sleeve board, and the asbestos-covered shelf provided for the iron when not in use.

Bookcase.—The bookcase, located in the front of the room near the teacher's desk, is 5 feet 2 inches high by 3 feet and will care for approximately 75 books and 35 bulletin boxes. It is movable, therefore could be used as a piece of furniture in the living area. Although the shelves are adjustable, the spacing is so planned as to use the three top shelves for books and the two lower shelves for bulletin boxes. The bookshelves are 9¾ inches apart and the bulletin box shelves 11 inches apart. It is possible to use the case for an art center. Its height will permit a picture to hang above it, and an arrangement of pottery, brass, or some other decorative object on top.

Bulletin Boards.—Bulletin-board space is located near a door and near the center of the seating space of the room, where all pupils can see it at the same time. The location will per-



FRONT VIEW OF UNIT DESK

Rear view identical. One partition dividing front from rear. Exterior, white oak; bread boards, birch; interior, yellow pine; porcelain leg bottom

mit the teacher to use it for posting illustrative material for pupils to see during class discussion. The space near the door will catch the pupil's eye on entering and leaving the classroom.

Mirror.—The mirror is on a standard in order that it may be moved to the place that affords the best light for fitting garments. It may be placed in the dressing room, although most teachers prefer that it be placed out in the classroom so as to use individual fittings as class problems.

Seating.—Chairs of the non-folding type are recommended. The most satisfactory chair is light-weight, well-braced, with a square bottom. It should support the back and allow the feet to rest on the floor. They necessarily have to be moved for many uses, therefore should be as light in weight as is possible and yet be substantial. Stools are not satisfactory for seating pupils while sewing or during class discussion. While they are easily pushed out of the way when not in use, they are uncomfortable and encourage poor posture.

Homelike Units.—In the end of the room near the storage closets is a unit kitchen and space for a combination living room and dining room. The kitchen is planned with equipment arranged to approximate that of a home kitchen. It will accommodate four girls. Groups of girls may be alternated as to work space until all pupils will have had the experience of working in the unit kitchen. The living area will provide opportunity for actual experience in working with home equipment in many units of work other than foods and clothing. It may be used for teaching arrangement of furniture, bed-making, home nursing, child development, and arrangement of art centers. No attempt is made in the drawing of the floor plan to show a desirable arrangement of furniture for the living area.

Storage.—Two closets are provided for storage of supplies, illustrative material, equipment, cook aprons, pupils' sewing materials, and for a dressing room. Either the day bed, stoves, or machines may be stored when not in use. The placing of the shelves and hanger rods should be carefully planned so as to fit the materials to be stored. Careful spacing will prevent waste space and will make sure all articles to be stored through the year can be cared for.

Items that Make for a Home Atmosphere

An attractive home-making department must be orderly and have attractive walls and floors. The most satisfactory floors as to ease on the feet and appearance are wood and linoleum-covered. Cement floors are durable, but hard on the feet, and dusty unless painted. Tile floors are attractive, but hard on the feet and expensive.

Wall finishes should be bright enough to give a cheerful appearance and to reflect enough light in the room. The wall is the background for the furnishings, therefore it should be a rather neutral color. Light tans and creams are a favorite color and are usually satisfactory.

Some of the touches that make for a home atmosphere are curtains, pictures, pottery and growing plants. Color may be introduced through these items. Care should be taken not to use too much bric-a-brac, thus giving a cluttered appearance.

The following principles may be used as guides in planning a home-making department:

(1) The department should present an attractive, homelike appearance. (2) The type of equipment should be within the income level of the surrounding community and should provide a home setting so far as it is possible. (3) Equipment should be arranged so as to have good lighting on all work centers, and should be grouped according to use so as to save steps. (4) Some movable equipment makes a room adaptable to more different uses. (5) Adequate storage space helps to care for equipment and will encourage neatness and orderliness among pupils.

DURING THE LUNCH PERIOD IN ONE OF THE OLDER FORT WORTH SCHOOLS

Reducing Waste in School Cafeterias

BY MRS. BENA HOSKINS

DIRECTOR OF CAFETERIAS, PUBLIC SCHOOLS, FORT WORTH, TEXAS

THE old adage, "A woman can throw more out the back door with a teaspoon than a man can bring in the front door in a scoop shovel," holds true in school cafeterias in as great a proportion as 20,000, the average number fed daily in the Fort Worth public schools, is to 5, the average number fed in homes. With the long line of marchers, varying in size from kindergarten tots to high school lads and lassies, interspersed with teachers and principals, as the ones who with their pennies, nickels, and dimes fill the scoop shovel, it is a challenge to our managers to see that few teaspoonfuls of waste go out of the back door via the garbage pail. "Watch the garbage can" has almost become the theme song of these 48 cafeteria managers and their helpers, so imbued are they with the idea that in the wise conservation of little things, the big things will take care of themselves.

While the transition of Fort Worth school cafeterias from days when members of Parent-Teacher Associations made soup and sandwiches in their own kitchens, carried this food in their own cars to the schools and served it from improvised tables in doorways to eagerly formed lines in the yards, to the modern and scientifically equipped eat-a-toriums of today, reads like a "happy ending," the writer will touch this side of the story only as it pertains to the elimination of waste.

Digression here is fitting to pay homage to parents and teachers who in Fort Worth and elsewhere made possible the first lunchrooms; in some instances even paying for the erection of a building, furnishing them by "kitchen showers" from their own homes and maintaining them by their own labor. Through their faith that a well-prepared noon meal is essential to a child's well-being, they convinced discerning school boards of the merit and practicability of their project.

From the time the first cafeteria was established in 1903, they were operated either by principals and teachers, or by P-T A's and principals. Coming into the system in 1926 as a manager, at the time that the Board of Education assumed and centralized control of all cafeterias, the writer of this article was elected Director by the Board in 1928. Although it has never been the policy of this department to make money, during the "fat" years when nickels and dimes flowed so freely in the average American home, there was, owing to the tremendous volume, a most substantial profit. This was put back into new and standardized food- and labor-saving equipment to replace much that was crude, improvised and unsanitary. During the lean years that followed we have managed not to operate at a loss, even with reasonable replacements; also, we have maintained our high standard of foods.

The greatest item of food-saving equipment is good refrigeration with adequate storage space. We have recently increased the latter by supplementing mechanical and ice refrigeration with air-conditioned boxes which need to be iced only once a week. Anything saving time and labor reduces operating expenses, thus allowing us to

MENUS FOR ELEMENTARY SCHOOLS

	Monday	*Tuesday*	*Wednesday*	*Thursday*	*Friday*
Plate:	Meat loaf Cabbage au gratin Candied yams Lettuce and tomato salad	Veal and oyster pie Green beans New potatoes—parsley buttered Combination salad	Chicken dumplings Buttered squash Lyonnaise potatoes Waldorf salad	Roast—barbecue sauce Buttered spinach Escalloped potatoes Stewed apricots	Fried fish—tartar sauce Creamed carrots Mashed potatoes Slaw
Sandwiches:	Swiss cheese Tuna fish	Toasted cheese Mock chicken	Bacon—lettuce and tomato on whole-wheat buns Ham salad	Peanut butter on raisin bread Tomato loaf	Pimiento cheese Goose liver
Salads:	Pineapple with cheese Asparagus	Stuffed egg Prune-orange-cheese salad	Salmon salad Garden salad	Tuna fish Pear salad	Cabbage—carrot Combination fruit
Desserts:	Apple snow Cherry cobbler Fruit cup Gelatine—whipped cream	Apricot pie Rice pudding Fruit gelatine—whipped cream Fruit cup	Apple pie Baked custard—whipped cream Gelatine—whipped cream Fruit cup	Chess pie Boston cream pie (using hot sweet milk cake) Fruit gelatine—whipped cream Fruit cup	Peach Bavarian Pineapple upside-down cake Gelatine—whipped cream Fruit cup

Note: In addition to the vegetables planned on the plate lunch, there are at least two other vegetables prepared each day.
Orange juice, tomato juice, milk chocolate, and both sweet milk and buttermilk are served each day.
Plate lunches, 10¢; salads, desserts, individual servings of vegetables, 5¢; drinks, 5¢.

MENUS FOR HIGH SCHOOLS

Plates:	Meat loaf, creamed onions, slaw with carrots Roast with dressing, baked potatoes, stewed prunes	Stew with vegetables (cook potatoes, carrots and onions whole; cook separately and add to stew when done), Spanish rice, combination salad Barbecued spare ribs, sweet potatoes with pineapple, apple sauce	Biscuit hash, spinach with mustard, stewed apricots Salmon loaf, escalloped potatoes, slaw with pineapple	Liver and onions, green beans, spinach salad Swiss steak, macaroni and cheese, tomato aspic	Fried fish—tartar sauce, buttered carrots, lettuce and tomato salad Wieners and kraut, potatoes in cream sauce, stewed prunes
Salads:	Tuna fish; potato; pear—cottage cheese; lettuce and tomato; Sunset salad	Stuffed egg; salmon; potato; pineapple—cheese; head lettuce—French dressing; Manhattan salad	Salmon; potato; peach with cottage cheese; jellied vegetable; half grapefruit	Stuffed egg; tuna fish; fruit; Golden Glow; head lettuce—French dressing	Ham; salmon; Waldorf; combination; stuffed prune; potato
Desserts:	Cherry cobbler; fresh apple pie; cocoanut fluff pie; Paradise pudding; plain gelatine—whipped cream; fruit cup; chocolate pudding; devil's food cake	Apple dumplings; raisin pie; chess pie; chocolate pie; banana fluff; fruit gelatine—whipped cream; fruit cup; tapioca pudding; hot sweet milk cake	Apricot cobbler; pineapple pie; syrup pie; baked apple—whipped cream; plain gelatine—whipped cream; fruit cup; floating island; banana cake	Fresh apple pie; old-fashioned lemon pie; butterscotch pie; prune whip; fruit gelatine—whipped cream; fruit cup; yellow cake with pineapple and cocoanut; orange tapioca	Pineapple cobbler; custard pie; Brown Betty—lemon sauce; plain gelatine—whipped cream; fruit cup; baked custard; plain cake—caramel icing

Note: In addition to the vegetables planned on the plate lunch, at least four are prepared each day.
Orange juice, tomato juice, milk chocolate, sweet milk and buttermilk are served each day.
Plate lunches, 15¢; salads, desserts, individual servings of vegetables, 5¢; all drinks, 5¢.

reach the goal to which all school cafeterias should aspire—maximum food values for pupils and teachers at minimum cost. Under the head of food-, labor- and time-saving equipment come bread and meat slicers and mixing machines for cake-making, egg-whipping, cream-whipping, etc. Other labor-saving devices are dish-washers, scientifically constructed tables, with racks for well-selected utensils, reliable stoves, steam tables and counters for attractive display of foods.

Under the head of labor, which in reality spelled dependability, came the first big saving when we practically eliminated student labor, whereby students were given lunch in payment for services rendered. We found this false economy, for it not only was a loss to the department, but was inculcating graft in wholesale fashion in the students. As an example, one boy who acted as cashier in the biggest high school in our state, began by letting a friend or two pass without paying. It takes small imagination to see that such practices would, and did, spread like wild-fire, for getting a free lunch would be a thing to boast about by students of that caliber.

With so many girls and boys undernourished during the last two years, we have had to use some student labor, but with our many other changes, the temptation to graft has been cut down and its perpetration made impossible.

We attribute the high quality of food served at a reasonable price to the following methods:

I. Menus are carefully planned more than a week in advance. In planning menus we consider the following:

1. Making nutritious foods, often disliked, extra-attractive in looks and taste.
2. Any left-overs may be absorbed next day.
3. Changing recipes to fit foods in season and market prices.
4. Preparing everything in kitchens, by which higher food values and lower cost may be obtained.

We make our hot rolls, cakes, and pastries. With guaranteed eggs, bought by weight, high-grade butter, whole milk bought in bulk for cooking, at a saving, we know the quality of ingredients. Our milk chocolate made from this bulk milk is higher in nutrition and costs less than that ready prepared.

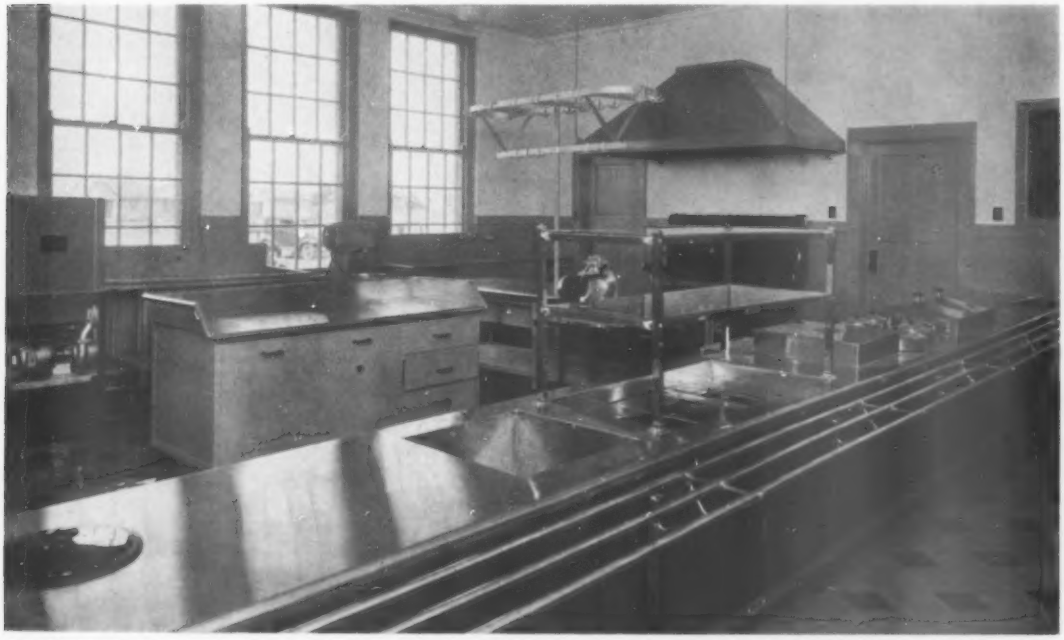
Orange juice made by adding four gallons of water to one gallon of true juice effects another saving.

Fowls are bought, dressed and drawn, with head and feet removed, by weight and not by number. This eliminates guesswork in the amount of servings, as well as untold labor.

Ends and left-overs of bread are toasted and stored in well-ventilated containers. This is used in three ways: (1) croutons for soup; (2) substitute for cracker-crumbs in escalloped dishes and for frying; (3) dressing for meats and fowls.

II. Menus are distributed to local newspapers, managers, and merchants. The results are:

1. Publishing the week's menus on the Sunday previous acquaints the parents with our products, giving them opportunity to discuss the items with their children with encouragement for the more wholesome selection. This helps, during the week, the sale of foods prepared.
2. Managers are able to plan their work and order advantageously.
3. Merchants, studying these menus in advance, are able to give better prices:
   a. They buy in larger quantities.



ARRANGEMENT OF EQUIPMENT, AND THE LABOR-SAVING DEVICES, IN THE CAFETERIA IN ONE OF THE NEWER FORT WORTH SCHOOLS

ANOTHER VIEW OF CAFETERIA EQUIPMENT IN ONE OF FORT WORTH'S MODERN SCHOOLS

b. They contract for such items as fish, fowls, and certain cuts of meat, without fear of loss.
c. They deliver staples, canned goods, mayonnaise, and pickles, and to some schools, eggs, and butter, once a week. Only fruits, vegetables and meats are delivered daily.

III. All supplies are ordered through the Administrative Office. This effects saving by:
1. Minimizing bookkeeping in cafeterias.
2. Undisturbed routine of food preparation.
3. Low prices given by merchants, who figure a saving in obtaining, each afternoon, the orders for 48 schools from the centrally located Administration Building.

IV. Into the office each day come all cash receipts, a full report of the number of customers, the kinds of food bought and orders for the following day. Savings by these methods accrue for these reasons:
1. A bonded deliveryman collects all lunchroom receipts each afternoon. This collection does away with: (a) expensive safes in cafeterias; (b) robbery insurance; (c) constant fear of robbery.
2. Each tray is checked. This tells: (a) number of customers; (b) food sold.
3. Immediately after lunch is served, each manager checks cash, number of customers, food sold and left-overs. With left-overs in mind, she prepares her orders for the next day. These, with her cash and reports, all of which the messenger collects, give to each manager and the Director a daily three-way check on cash, food, and customers—and the three must balance.

V. Inventory of candy every Friday, and of entire stock once a month, results in:
1. Knowing the exact proportion of candy sold. We do not encourage the sale of candy until after a wholesome meal has been eaten.
2. Increased watchfulness over all stock and especially candy, so easily misplaced.
3. Elimination of guessing at profit and loss.

VI. Absolute cleanliness: hygiene and profit.

This can be obtained when foods, particularly fruit and vegetables, are carefully sorted, using the more perishable first. Refrigerators that are cleaned daily and everything in them moved, do not hold left-overs. Nor do stoves so clean that they won't soil a napkin, harbor forgotten food.

VII. System of Administrative Office:

The Cafeteria Department is controlled by Ed. P. Williams, Business Manager for the entire system of the Fort Worth Public Schools, and the Director. Giving their full time in the office of the Director, who spends her mornings visiting the various cafeterias, are secretary, cashier and bookkeeper, accountant.

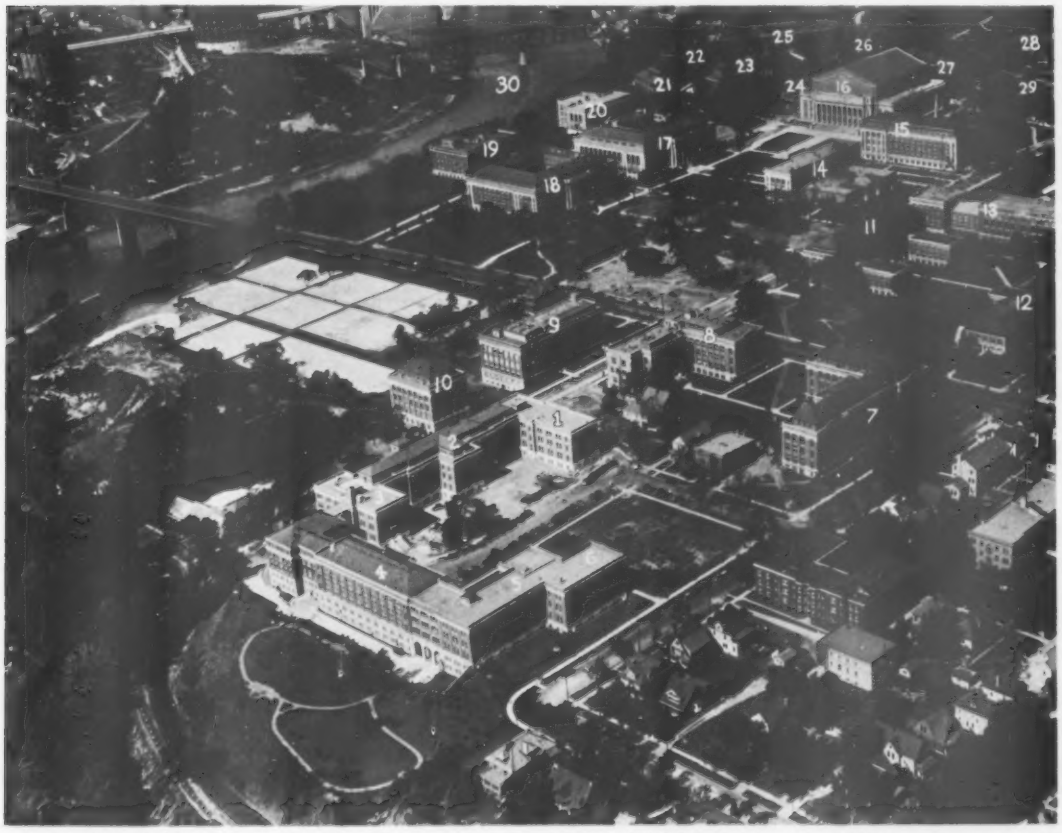
In addition to our own constant vigil, our books are audited monthly by a firm of certified public accountants, employed by the public schools to do their business. This auditing service, that part of his time which the Business Manager gives to our department, and the use of the portion of the school buildings occupied by the cafeterias, are the only expense borne from school funds, that is, tax money. Besides paying our utility bills, the salary of every one in the department, from the trained office force, including the Director herself, to the merest helper, is paid from funds derived from the sale of lunches.

The Students' Health Service of the University of Minnesota

BY ROBERT B. RADL, M.D., M.S., F.A.C.P.
Minneapolis, Minn.

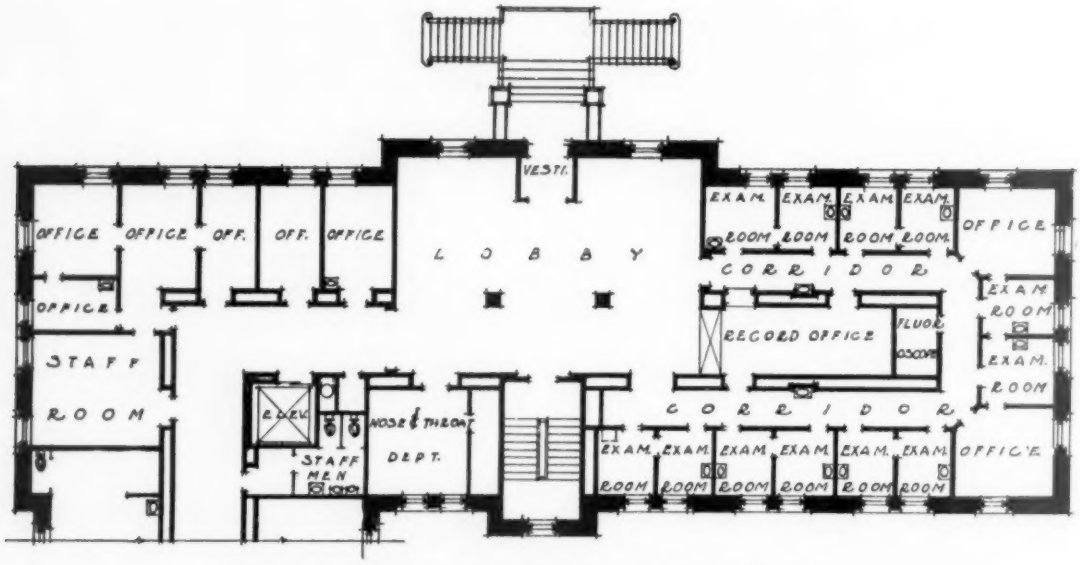
THE Students' Health Service Building of the University of Minnesota was constructed in 1928 and 1929. For ten years prior to this the Health Service had been functioning in improvised quarters in another building on the campus. The new building was constructed as an addition to the Minnesota General (University) Hospital. The hospital is located on the southern part of the main campus in the area frequently called the medical campus. The accompanying aerial photograph shows the physical relationship of the Health Service building to the rest of the University campus. The points of the compass on this photograph correspond rather closely to those of the ordinary map; that is, north is toward the upper part of the picture, east to the right, etc.

In order that a Health Service shall be able to serve the student body most efficiently, it is desirable that its location be such that it is easily accessible. That this has been accomplished by the location of the building is demonstrated by the picture, which shows the short distance between the Health Service and the chief points of student concentration on the campus. Students



THE HEALTH SERVICE BUILDING ON THE CAMPUS OF THE UNIVERSITY OF MINNESOTA, MINNEAPOLIS

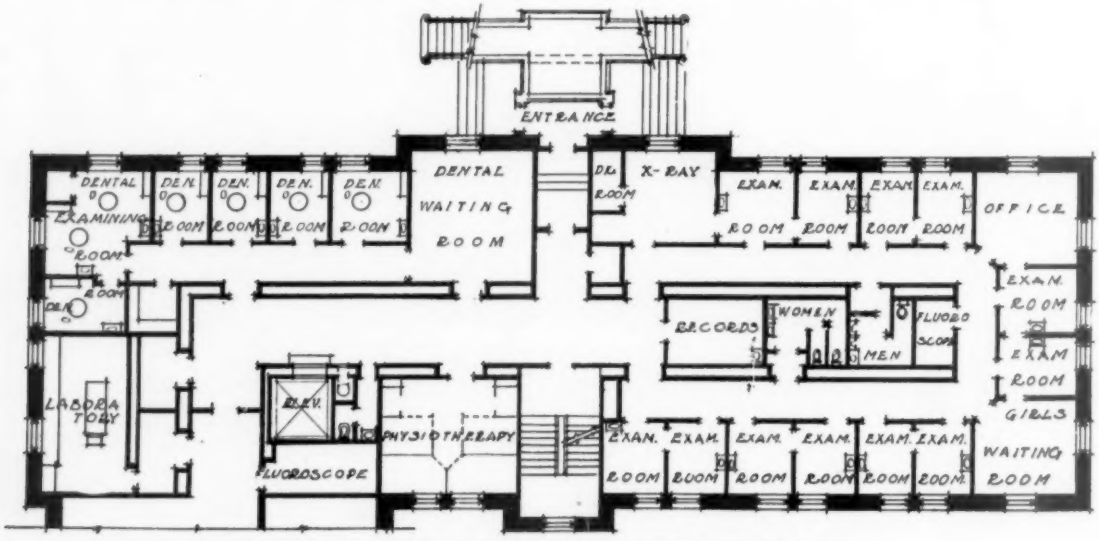
1. Health Service
2. Out-Patient Department, Univers.ty Hospital
3. Eustis Children's Hospital
4. Minnesota General (University) Hospital
5. Cancer Hospital
6. Todd Eye, Ear and Throat Hospital
7. Millard Hall (Physiology, Bacteriology and Pharmacology)
8. Anatomy Building (Anatomy and Pathology)
9. Zoology
10. Botany
11. Civil Engineering and Architecture
12. Mechanical Engineering
13. Electrical Engineering
14. Physics
15. Administration Building
16. Northrop Memorial Auditorium
17. University Library
18. School of Chemistry
19. School of Mines and Metallurgy
20. Law School
21. College of Pharmacy
22. Psychology and State Board of Health Laboratory
23. Music Building
24. College of Dentistry
25. College of Education
26. School of Business Administration
27. Men's Union
28. Old Physics Building (Social Science Departments)
29. Pillsbury Hall
30. Mississippi River



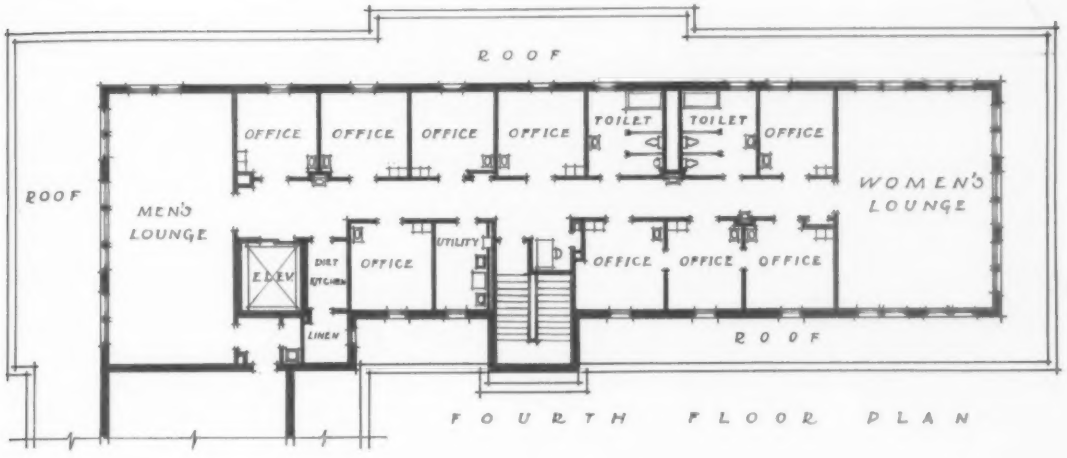
FIRST-FLOOR PLAN OF THE HEALTH SERVICE BUILDING

who live in the vicinity of the University reside for the most part in rooming-houses and fraternity and sorority houses within a few blocks of the campus to the north and to the east. The Medical Science building, which adjoins Millard Hall, a new nurses' home adjoining the hospital on the southeast and two large dormitories for men one block east of the hospital are not shown in the photograph. Plans to construct the new building in conformity with the remainder of the hospital caused no difficulty, and time has shown the wisdom of the choice of location which was made.

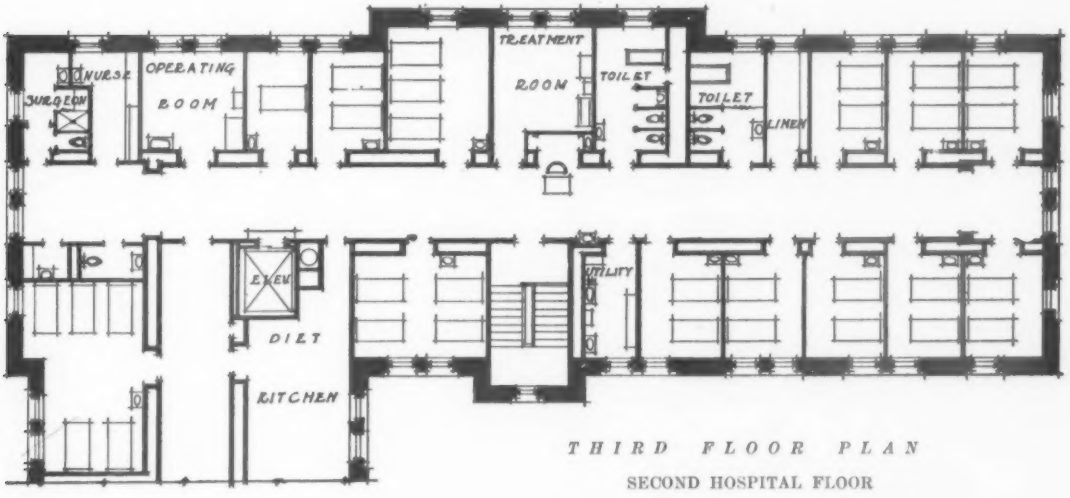
Some discussion of the policies, objectives, and administrative plans of the Health Service may be of value. Briefly stated, the objectives are the improvement of the physical and mental health of students, the prevention of disease, the education of the student body in the essentials of healthful living, and the development by college men and women of a sound and sympathetic attitude toward modern scientific health practices, including diagnosis, prevention and treatment. In order to accomplish these objectives, the Health Service carries on various lines of activities: physical examinations; health consultations; medical and dental care of students; health instruction; mental hygiene and sanitation. Physical examinations with follow-up consultations are given to all students at the time of entrance to



PLAN OF GROUND FLOOR, HEALTH SERVICE BUILDING

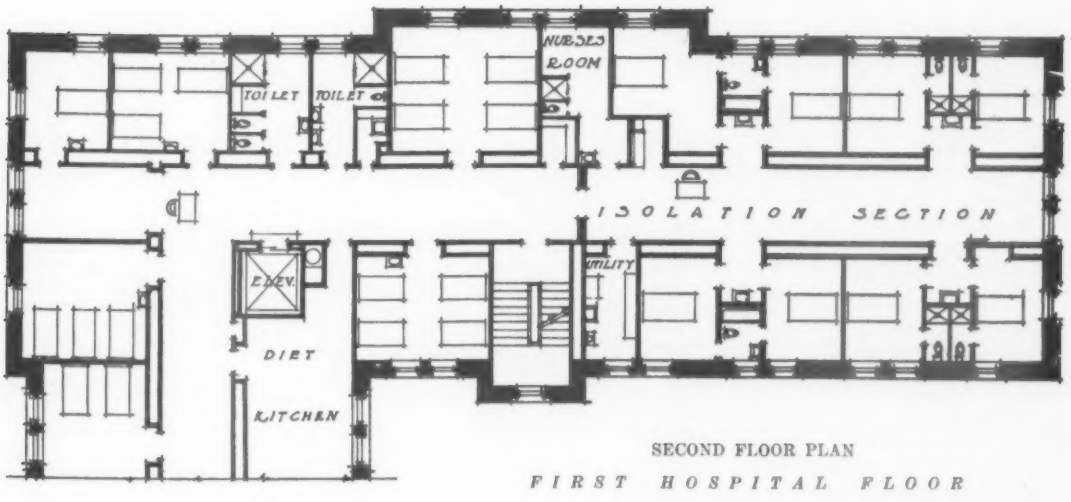


FOURTH FLOOR PLAN



THIRD FLOOR PLAN

SECOND HOSPITAL FLOOR



SECOND FLOOR PLAN

FIRST HOSPITAL FLOOR

LOBBY, LOOKING TOWARD RECORD OFFICE AND EXAMINATION OFFICES

The archways of the corridors can be seen to the right and left of the record office

the University. Recommendations as to programs of study and physical activities are based upon the results of these studies. Annual complete (so-called periodic) health examinations are required of students in the Colleges of Medicine, Dentistry, Nursing and Education and are urged but not required for students in other colleges, especially for those of the senior classes. Informal health instruction is given by medical counselors throughout their contact with students in addition to the formal courses offered.

Medical service is provided through the dispensary or out-patient department of the Health Service. Physicians and nurses are available to see students here throughout the day and evening and can be called during the night. Specialists in the various fields of medicine and surgery are also provided. Mental hygiene service is rendered by a psychiatrist who devotes his full time to interviewing students who are more or less handicapped by emotional problems. Dental service includes dental examinations, prophylaxis and operative dentistry. A medical laboratory serves jointly the Health Service and the Outpatient Department of the Minnesota General Hospital. The arrangement, however, prevents intermingling of the two groups of patients.

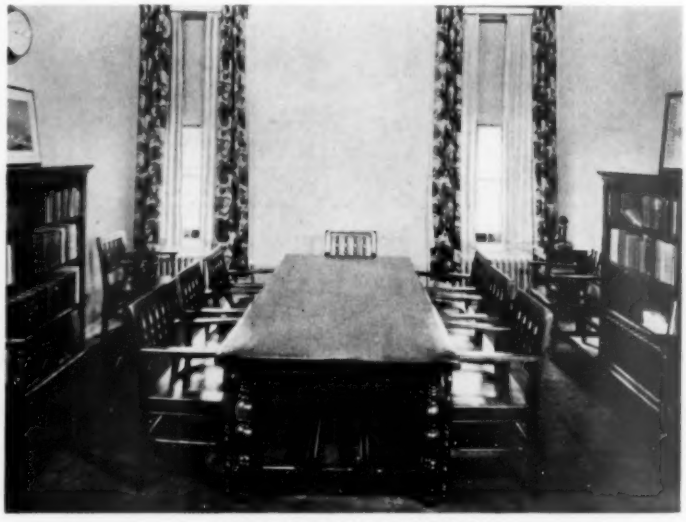
Students requiring hospitalization receive care on the third floor if the illness is of a non-communicable nature. If isolation is required, as for a communicable disease, the patient is placed on the second floor. A fourth floor or roof-house has recently been added; this is not shown in the aerial photograph.

In addition to general medical, surgical, and dental care, the necessary specialties to care for the illnesses of the students are represented. The attending staff, all the members of which are regularly licensed physicians, is necessarily a complete and rather large one. Practically all the staff have had special training in their respective fields, whether this be preventive medicine and public health or a medical or surgical specialty. There are nine members of the staff who devote all their time to Health Service work and teaching in the Department of Preventive Medicine and Public Health of the Medical School. The Director of the Health Service, Doctor H. S. Diehl, is also Director of the Department just mentioned.

The part-time physicians, 25 in number, are in active practice in either Minneapolis or St. Paul, and spend varying amounts of time at the Health Service. Nine part-time dentists comprise the dental staff. In addition, there are graduate nurses, laboratory, X-ray and physio-therapy technicians and trained clerical workers.

Cooperation of Health Service and Hospital

While the Health Service and the Minnesota General Hospital are entirely separate units as regards administration and patients, the affiliation is mutually advantageous. The Hospital furnishes nursing care, food, laundry service, and drugs for all Health Service patients, for which the Health Service reimburses the Hospital. Medical service for students is provided by the Health Service staff. The major operating by Health Service surgeons is done in Hospital operating-rooms. Dental X-rays and X-rays of ex-



STAFF ROOM AND LIBRARY

tremities are taken at the Health Service, but those requiring more complete X-ray equipment, such as chest, gastro-intestinal, etc., are taken at the Hospital. Internes of the General Hospital get a valuable service in the Health Service section, and at times patients of the General Hospital are cared for in the isolation section of the Health Service.

The following table, taken from the annual report, July 1, 1933, to June 30, 1934, is representative of some of the activities at the Students' Health Service of the University:

PHYSICIAN'S EXAMINATION ROOM—ONE OF THE LARGER ONES

Total number of University students (all of college grade and eligible for care at the Health Service)	11,100
Entrance physical examinations	4,122
Periodic health examinations	2,059
Dispensary visits (including medical and surgical attention, visits to specialty clinics and immunization procedures)	57,741
Dental visits	9,342
Laboratory examinations	18,760
X-rays (including those done at the University Hospital, at the Health Service and dental X-rays)	4,312
Hospital admissions	982

The Floor Plans of the Health Service

The plan of the ground floor of the Health Service is shown on page 342. As may be noted, approximately the right half of this floor consists of examination rooms; these are used for freshman physical examinations and periodic health examinations. A corridor surrounds a center portion which is utilized for records, a fluoroscopic room and toilets. The room designated on the plan as the dental waiting room is used as an office for the dental department, the cashier of the Health Service and the optician. The X-ray room, dental department laboratory and physiotherapy room are shown.

ONE OF THE DENTAL ROOMS

The first or main floor is primarily for medical care of ambulatory students. It contains the main lobby or waiting-room, the main record office, offices for some of the full-time staff, the general and special clinic examination rooms, and the joint administrative offices of the Director of the Health Service and the Department of Preventive Medicine and Public Health of the University Medical School. A corridor similar to that on the ground floor may be seen. A view of the main lobby and waiting-room is reproduced herewith. In the center foreground is the record office and dispensary desk to which students come when they wish medical advice or treatment or wish to make an appointment. When a student makes such a request, his record is taken from the file by a clerk and passed through an aperture, not shown in the picture, to a nurse, who calls the patient and directs him to a physician in one of the adjoining examination rooms. In no instance is it necessary for a student to handle his own record. Prescriptions for drugs are presented by students to this same desk, from which they are sent through a tube conveyor to the drug-room of the Minnesota General Hospital. In a few minutes the filled prescription is returned in another tube and may be obtained by the student.

The staff-room is used as a library and consultation room by members of the staff. In addition to informal conferences, regular weekly staff meetings and seminars are conducted.

The examination rooms are arranged in suites so that it is possible for a physician to use either one or two rooms at a time. The standard equip-

ment of these rooms consists of a lavatory, an examining table, a desk, two chairs, a wall-type blood-pressure apparatus, and a cabinet or shelf for medications, instruments, and dressings. Similar equipment is found in the periodic health rooms on the ground floor.

The plan of the first Hospital floor shows the section designed for purposes of isolation. On this floor there is no division between the Health Service hospital and the Minnesota General Hospital. This arrangement was made to provide a flexibility in the bed capacity of either the Health Service or the main Hospital; during certain periods of the year, the Health Service has use for only a small number of isolation beds, while during other periods, this number is insufficient. This is likewise true of the main Hospital. The isolation section is inadequate in event of an extreme epidemic of communicable disease among the student body. Additional space may then be obtained in the main Hospital; or the Health Service Building on the agricultural campus, three miles distant from the main campus, may be used. The agricultural campus Health Service has under its care to the greatest extent students below college grade in the School of Agriculture. It is attended and supervised by the Health Service staff.

The third floor is the hospital section for student patients with illness of a general nature. Small rooms with a capacity of one to four beds seem most practical for this type of patient. Most of the rooms are of the two-bed type, although there are single rooms and a few three- and four-bed wards. Each room contains a lavatory and a wall locker for the patient's clothes and belongings.

The fourth floor, or roof house, was completed in 1934 and fills a need for more space for physicians' offices and for emergency hospital space. There are two large lounges at either end, one for men and one for women. These are designed as rest rooms for ambulatory and convalescent patients who are hospitalized on the floor below. The entire floor is fitted up, however, for use as a hospital section when needed: nurses' desks, service rooms, diet kitchens, and complete nurses' signal lights are present in the lounges and the physicians' offices. The entire floor could promptly be changed to a hospital floor, giving two large wards (in the lounges) and a number of two-bed rooms. This would be very desirable, especially during times of an epidemic when additional room might be necessary. At the present time only the lounges are used for hospital patients. The mental hygienist has a suite of rooms on this floor for his own office and the social worker who works with his department. Students are seen by him by appointment. The other physicians who have offices here see some patients by appointment in their offices, but in general most student patients are seen on the other floors. Stenographic offices are also on this floor.

The equipment throughout the institution is complete both for the practice of medicine, surgery and dentistry, and for the care and comfort of the students. It is our feeling that the physical plant as described, with an adequate, well-trained, attending staff, assures a high degree of medical care in all its phases for the student group.

Dormitory Design

BY J. BINFORD WALFORD
ARCHITECT, RICHMOND, VIRGINIA

IN these times an architect is seldom given the opportunity of originating the design or layout of an institution. Usually this has been done by some other architect when the institution was established.

The architect planning additional buildings for the group should follow the established design; however, he should be given some latitude so that he may use his own skill in developing variations of the established design in order to avoid a monotonous appearance. Each building should be designed as a part of the whole group and not merely as an individual building. Every institution should have a well-developed layout, showing the location of all future buildings, so that as each one is erected it will not be located at random but will be a definite part of the general scheme.

Attention is called to the campus plan of the College of William and Mary, Williamsburg, Va. This plan was begun some fifteen years ago, by the firm of which I was a partner at the time, in collaboration with Charles F. Gillette, landscape architect. Now I have the pleasure of carrying this plan out to completion. The east portion of the campus, containing the Wren Building, originally erected in 1695, the president's house, erected in 1732, and Brafferton Hall, erected in 1723, has been recently restored to its original appearance through the generosity of John D. Rockefeller, Jr. The administration and architects have restudied the plan from time to time, and changes have been made in keeping with the administration policies and the development of the college.

The trend in dormitory planning in later years has been from large units, where a great number of students are housed together, to smaller units, separating them into groups. However, this policy should be well discussed by the administration and architect before the actual planning is started.

Where a large number of students are housed together in one building, they may be successfully separated into smaller groups by a central feature or by the introduction of doors. This plan is illustrated by the accompanying layout of a new group of dormitories recently erected at the State Teachers College, Fredericksburg, Va. (See page 350.)

Two Interesting Examples

The group consists of three buildings. The east and west wings are small units accommodating 48 students each. The central building is divided into two units, accommodating 56 students each, separated by a central lobby with circular balconies on the second and third floors. This group houses a total of 208 students. It contains 722,000 cubic feet, costing 34 cents per cubic foot, and $1,177 per student, excluding architect's fees.

Taliaferro Hall, a new dormitory for men at the College of William and Mary, illustrates the latest plan in dormitory construction where small units are introduced accommodating few students. This building is divided into four separate units, accommodating from 12 to 21 students each. Two of these units are entirely independent of the others, and a student must go out of doors to visit another student in one of the other units. The other two units open on a common stair hall. This building accommodates 68 students and, in addition, has tea-room facilities. It contains 180,000 cubic feet, costing 39 cents per cubic foot and $1,025 per student, excluding architect's fees.

J. Binford Walford, Architect

TALIAFERRO HALL, MEN'S DORMITORY,
COLLEGE OF WILLIAM AND MARY, WILLIAMSBURG, VA.

Toilet and Bath Facilities

The toilet and bath facilities of a dormitory should be very carefully thought out by the administration and the architect. The idea of a common toilet and bath is rapidly becoming a thing of the past, unless funds are very limited. Where there are small units, a common toilet and bath may be more satisfactorily used; but in dormitories housing a large number of students, there should be a private or semi-private bath between each pair of rooms. This plan is carried out in the new dormitory group at the State Teachers College at Fredericksburg.

Where the private toilet and bath are to be used by two rooms, if the toilet and bath are made semi-private, a freer use of the lavatory facilities is provided for all students using this room.

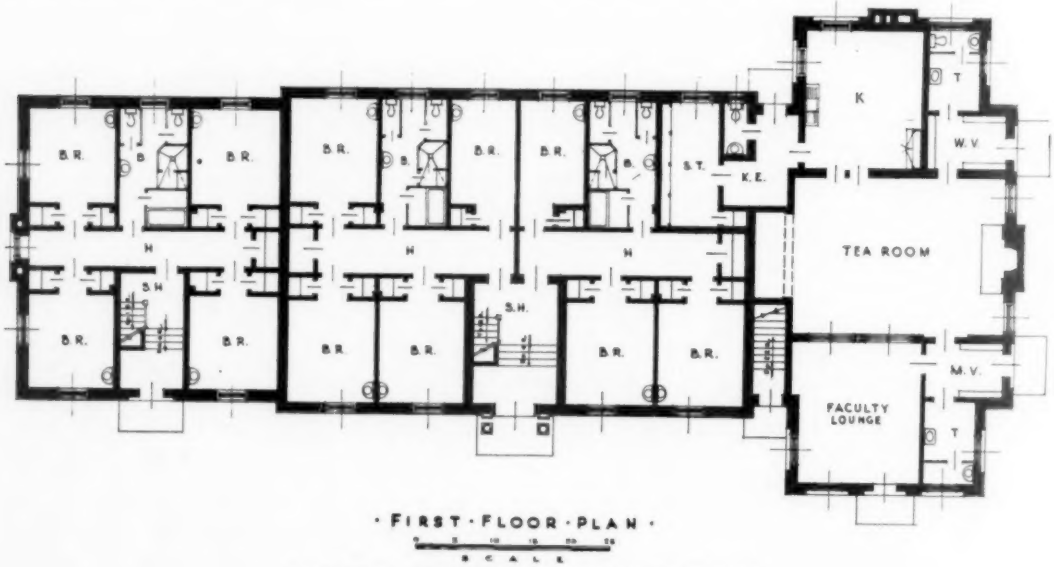
I have found by experience that when showers are placed on the dormitory floors they give the maintenance division continuous trouble, and therefore I have recommended that all shower facilities be located in the basement. If the showers are placed on the upper floors, great care must be taken in waterproofing the floors, and a lead or copper pan should be placed under the dressing rooms as well as the shower compartments.

Dining Room—Kitchen—Lounge —Laundry—Trunk Storage

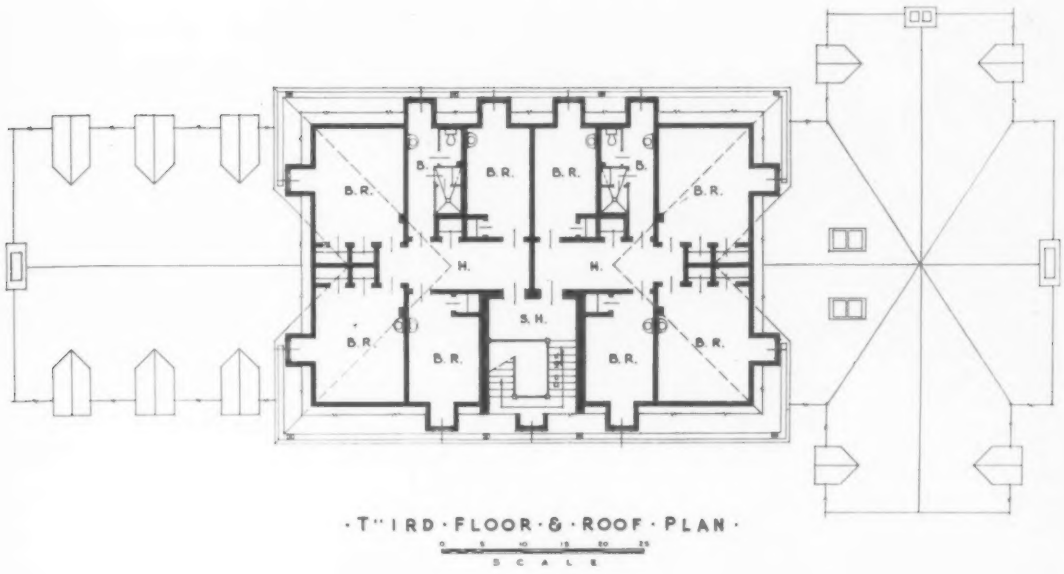
If the institution has a central dining room and kitchen, these facilities will not give the designer of the dormitory any concern. If, however, the dining room and kitchen are to be in the dormitory, the dining room should be as central as possible, with the kitchen located to give easy access to the dining room as well as to outside supplies. The kitchen should be placed so as to prevent odors from sifting through the dormitory section of the building.

No modern dormitory is complete without parlor and lounge space for the occupants. This creates a homelike atmosphere and provides a place for the entertainment of guests.

A pressing room with laundry-tub facilities should be available, so that it will not be necessary for students to do light laundry work in the bedrooms, and so that irons can be concentrated in one room. If irons are used promiscuously in the dormitory, there is great danger of fire.



LAYOUT OF FIRST FLOOR OF TALIAFERRO HALL



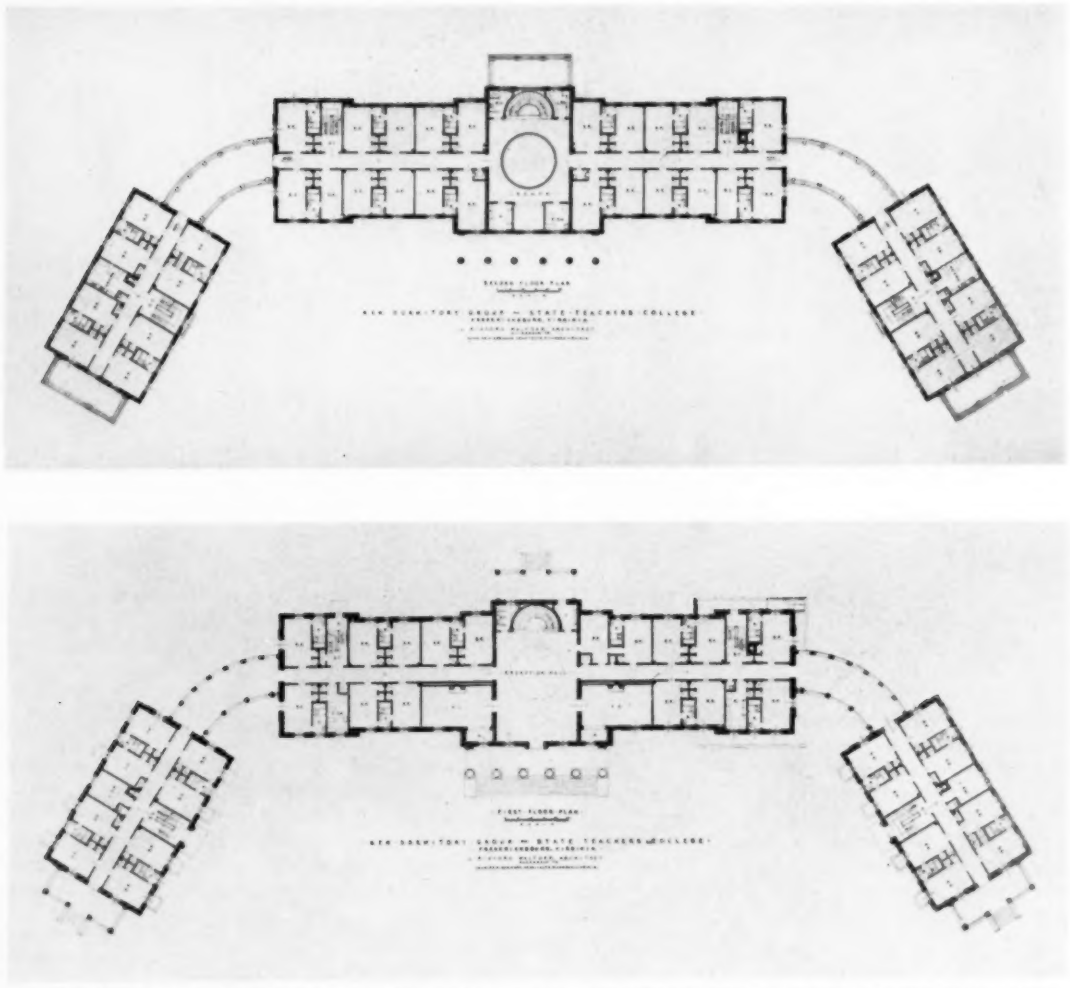
A small kitchenette is always acceptable to students, especially in a girl's dormitory, so that they may prepare light refreshments, such as candy, hot chocolate, sandwiches, etc. This helps to develop a spirit of comradeship among the students.

Space should be provided in the attic or the basement for storage of trunks. The practice of placing trunks in the corridor creates a fire hazard, in addition to an unsightly appearance. Racks built of wooden uprights and horizontals supporting slat floors, three tiers high, have been found convenient in providing space for the easy placing and removing of trunks. If these racks are built in the basement, the slats of the bottom tier should be a few inches above the basement floor.

Floor Surfaces

The interior finish of a dormitory should be considered carefully, and, of course, the available funds will largely determine the choice of materials. A floor of oak, rift pine, or maple is very satisfactory. One objection to wood floors, however, is that where smoking is allowed in the

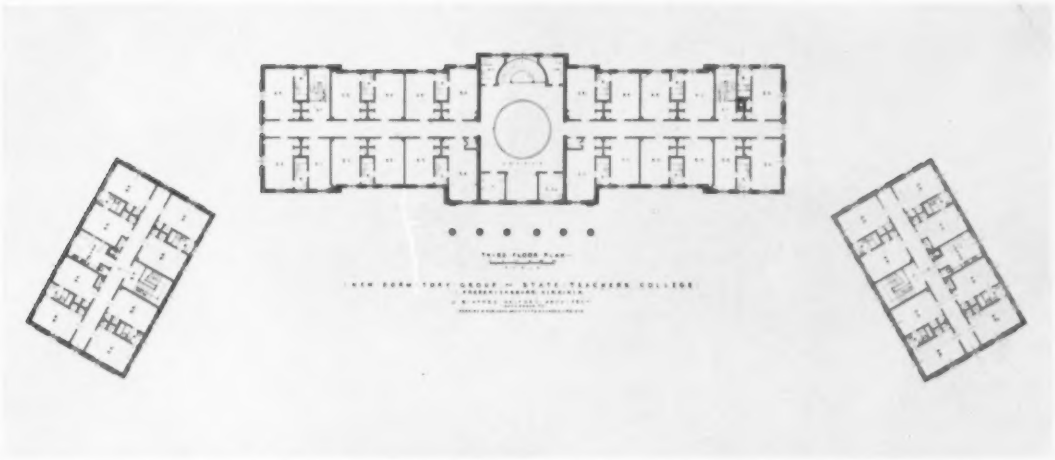
SECOND- AND (at top of page) THIRD-FLOOR PLAN OF THE MEN'S DORMITORY, COLLEGE OF WILLIAM AND MARY



FIRST-FLOOR PLAN, AND (at top) SECOND-FLOOR PLAN, DORMITORY GROUP, STATE TEACHERS COLLEGE, FREDERICKSBURG, VA.

J. Binford Walford, Architect

ARCHITECT'S DRAWING OF NEW DORMITORY GROUP AT STATE TEACHERS COLLEGE, FREDERICKSBURG, VA.



THIRD-FLOOR PLAN OF DORMITORY GROUP, STATE TEACHERS COLLEGE, FREDERICKSBURG

rooms the floors will be scarred with burns. The fire risk should also be considered in selecting finished floors. In a number of dormitories I have used a hard-surface composition floor which eliminates this objection.

The surface of corridor floors is very important and should be of a material that can be readily cleaned. If a hard-surface floor such as terrazzo is used, thereby increasing the noise, the ceiling can be treated with acoustical plaster or other sound-deadening material, which will add greatly to the comfort of the occupants.

Bedroom Equipment

The bedroom, which is the essential feature of a dormitory, should be carefully studied as to size, depending on the number of occupants, and should contain a closet for each occupant. Closets should be provided with at least two shelves and a horizontal rod on which clothes hangers can be attached under the lower shelf. A few additional clothes hooks are desirable in each closet. A bookcase built into the wall, and a full-length mirror secured to one of the doors, add greatly to the utility and attractiveness of a bedroom. In addition to the ceiling light, wall receptacles should be placed at convenient places to provide lights for study tables, dressers, etc.

Costs

An architect should not mislead his client in regard to preliminary cost, for both will be headed for trouble if the bids received exceed the appropriation. The wise architect will call in a well-experienced estimator from some successful construction company and have him make a close approximate estimate from his preliminary sketches and outline specifications. The practice of comparing the cost per cubic foot of various dormitories, or of any other buildings for that matter, must be carried out with a thorough understanding of the construction of the buildings in question. There are a number of items which contribute largely to the cost of a building and which should be borne in mind when comparisons are made; such as the materials and architectural design of the exterior, the interior construction, the interior finishes, bath and toilet facilities, and other mechanical equipment, for all of these contribute largely to the variation in the cost.

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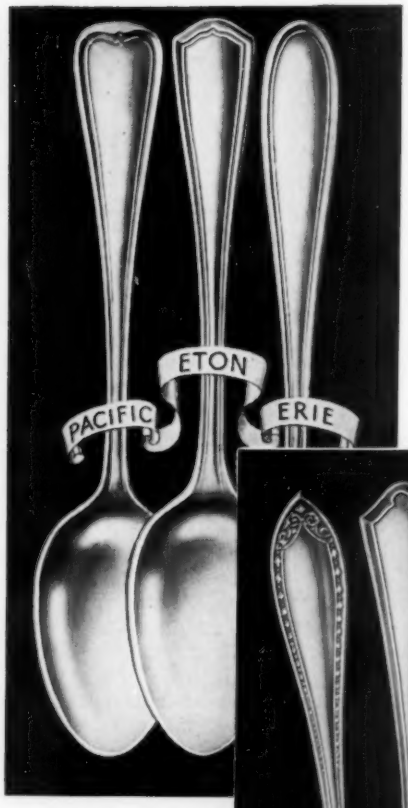

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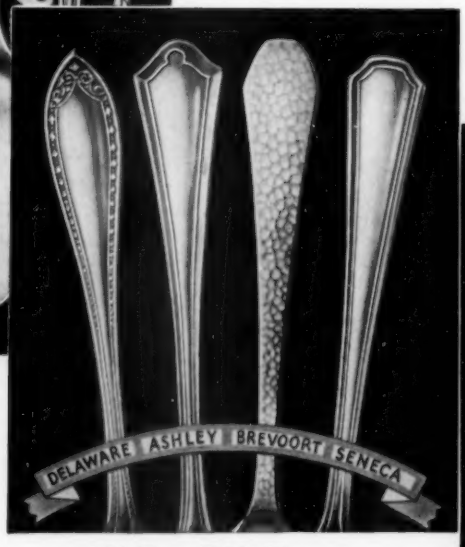

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	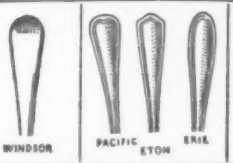		
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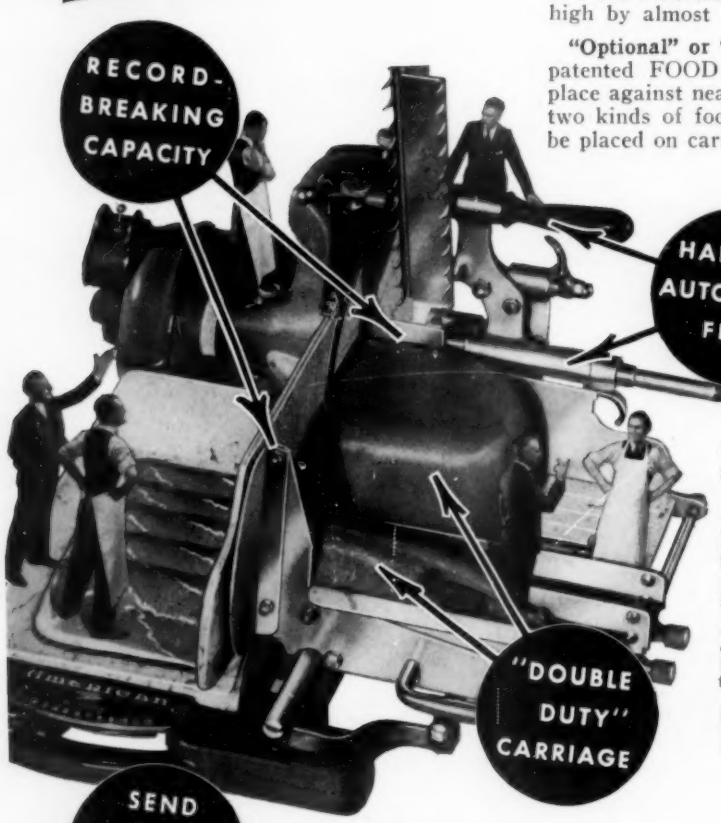

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Stationary Steam Jacketed Kettle
5 to 250 gallons

We build the standard STEAM JACKET KETTLE of these metals in many standard sizes, in either the stationary or tilting type. All have large steam jackets for quick heating, and all are finely finished to compare with the other modern equipment of the up-to-date kitchen. The CEREAL COOKER is made of any metal, and of either the permanently assembled type shown or with the lift-out cereal container.

Urn
20 to 150 gallons

The institution type COFFEE URN in copper, aluminum, or pure nickel is in wide use where large amounts of coffee or tea are wanted. With a Bucyrus Urn coffee can be made from the cold water in thirty minutes.

THE GAS HEATED STEAM JACKETED KETTLE is the result of forty-six years of experience in the design and construction of kettles of this type. The improved gas burner gives a maximum of heat with minimum consumption of gas.

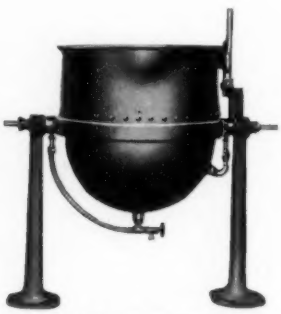
The Administration Building at the "Century of Progress" in Chicago installed one of these Bucyrus Kettles when they began operations several years ago, and many public and private institutions and schools throughout the country have them in use.

Gas Heated Steam Jacketed Kettle
10 to 100 gallons

Write for catalog of our kettles, and remember that we supply your requirements in any metal you want. Your Supply House can furnish Bucyrus Kettles, or they can be secured direct from our factory or branches.

Full Jacketed Steam Jacket Kettle
5 to 150 gallons

Cereal Cooker
10 to 100 gallons



Tilting Steam Jacketed Kettle
5 to 100 gallons

Steam Jacketed Kettle for Diet Kitchens
2 to 40 quarts

CHAMPION DISH WASHING MACHINE CO.

Main Office and Factory

Erie, Pennsylvania

CHAMPION offers a most complete selection of sizes and types of up-to-date dish washing machines, designed to meet the requirements of any school or university. The machines range in capacity from 2500 up to 21,000 pieces per hour. The price range is from $300 to $3300.

There are three different types, described briefly as follows:

1. Rack type for hand feed. In this type there are assorted wood or metal racks to hold the pieces being washed. These racks are pushed through the machine by hand.

2. Rack type for automatic feed. The same racks are used but are taken through the machine automatically, thereby saving time for the operator and promoting better and more uniform results.

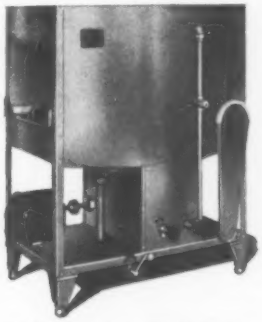
3. Belt conveyor type. There are no racks used, as the pieces to be washed are laid flat on the conveyor which carries them through the machine without further handling. Wire mesh baskets are used for silver or other small pieces.

The type to be used depends on the class and the amount of work to be done, the space available, and the ideas of the person in charge. We shall be glad to discuss with you, either by mail or through a representative, the advantages of each type for certain work and its application to your particular problem.

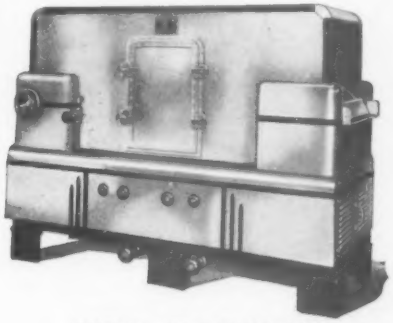
All CHAMPIONS offer these advantages: Lower cost—both in first cost and in upkeep. Longer life—due to careful selection of materials best suited for each purpose. Larger capacity—due to highly efficient pumps and spray system. Easy accessibility and operation—due to careful planning and provision of many important construction features not found on other machines.

Please write for complete circulars on any or all types. Architects will be interested in our A. I. A. dimension print folder.

MODEL 1-SD4 CHAMPION
Rack Type for Hand Feed



MODEL 20-B CHAMPION
Rack Type for Automatic Feed



MODEL 400-B CHAMPION
Conveyor Belt Type

CONTINENTAL SALES COMPANY

Complete Lines of
INSTITUTIONAL FURNITURE AND FURNISHINGS

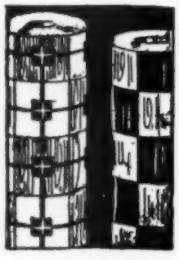
192 Lexington Avenue, New York
(LExington 2–5261)

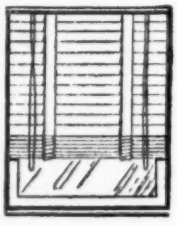
Centralize Your Purchasing of School Furniture and Furnishings, Equipment and Supplies for Dormitory, Kitchen, Cafeteria, Club Room, Office, ***for Economy, Efficiency,***

Centralized Purchasing and All-'Round Satisfaction

A great simplification of the problem of purchasing furniture and furnishings for the various rooms and departments of your school buildings can be accomplished by dealing with a single responsible concern, instead of dealing separately with the hundreds of individual manufacturers which such a concern represents. Whatever your requirements are in furniture, equipment or supplies for dormitory, cafeteria, kitchen, club room, office or library, you can be assured of quality equipment at a favorable price, prompt and efficient service, and special advisory service wherever desired, by simply writing and stating your problem to one central concern—the Continental Sales Company.

The Continental Sales Company particularly solicits your inquiries on any of the items herein listed. Prompt attention will be given to each inquiry. Detailed specifications and price quotations will be sent on request. The Company is also well equipped to supply practical plans and room layouts, also interior decoration service, to meet any specified requirements.





Furniture
Both Metal and Wood, for Interior or Outdoor Use — Chairs, Tables, Desks, Beds, Springs and Mattresses, Pillows, Studio Couches, Bookcases, Bureaus, Cabinets, Wardrobes

Carpets and Rugs
Wiltons, Axminsters, Orientals; Figured and Plain; Linoleums and Oilcloths

Linens, Etc.
Bed Linen, Table Linen, Towels; Blankets—Part Wool or All Wool; Bath Mats, Shower Curtains—All Grades, from the Least Expensive to the Best That Money Can Buy

Shades and Draperies
All Types, Sizes and Grades of Window Shades, Draperies, Curtains, Venetian Blinds

Restaurant Equipment and Supplies
Stoves, Steam Tables, Kitchen Tables, Dining Tables and Chairs, Refrigerators, China and Porcelain Ware, Silverware, Stainless Steel Cutlery, Glassware, Aluminum Ware, Kitchen Utensils, Coffee Urns, Food Choppers, Slicers, Mixers, etc. Electrical, gas and oil equipment of all kinds. Lighting fixtures and fans.

Playground Equipment
Bleachers, Gymnasium Equipment, Park Benches, Playground Equipment

Centralize your purchasing for economy and efficient service. **Write the Continental Sales Company for prices and specifications.**

DOEHLER METAL FURNITURE CO., Inc.

DORMITORY CAFETERIA **BEDROOM RESTAURANT** **INFIRMARY CHAIRS**

General Offices: 192 Lexington Ave., New York City

Durable

Doehler metal furniture is sturdily built from heavy gauge steel. It is specially designed to withstand the hard use and abuse of institutional routine. Its strength does not diminish with the years.

The newly developed "Dohlite" finish, fused on the metal at high temperatures, withstands cracking, chipping, loosening and softening whether from heat, water, flame or hard knocks. It makes the furniture almost indestructible.

Attractive

The charm of Doehler designs has given an entirely new meaning to "metal furniture." It is produced in conservative period designs as well as in the contemporary mode. Offered in a wide choice of finishes including natural reproductions of walnut, mahogany and maple. The color finishes are tastefully developed in ivory, grey, green, etc. Doehler metal furniture remains neat and attractive indefinitely. It never looks shabby or worn.

Sanitary

Doehler metal furniture is always fresh and clean. The all-metal construction offers no attraction for vermin, dirt or germs. It does not retain odors. The polished surfaces require little attention to keep them neat and spotless. Scrubbing and washing will not affect the waterproof finish.

Doehler metal furniture will not suffer from periodical disinfecting or fumigating. Its widespread use in hospitals is ample evidence of its sanitary qualities.

Comfortable

Doehler metal furniture is thoroughly comfortable. Regardless of climatic conditions, it offers perfect service — the drawers never jam, no glued joints to loosen, no veneered surfaces to crack. May be placed anywhere without damage—near open windows or next to steam radiators. Doehler furniture is comfortably silent. Drawers glide quietly on slides. They are cushioned by rubber bumpers. All other parts thoroughly sound-deadened.

Economical

Doehler metal furniture is highly economical, both in original cost and in upkeep. It is priced well within the reach of the most modest budget. Doehler prices compare favorably with those of ordinary wooden furniture. The usual heavy costs of repairs and maintenance are practically eliminated due to the sturdy construction and superdurable finish of Doehler equipment.

All Purposes

Our standard lines include metal furniture and equipment for dormitories, bedrooms, infirmaries, cafeterias, offices, etc. If specially designed pieces are required, we welcome an opportunity to co-operate with you. We can serve you advantageously—quality equipment at very favorable prices. This is clearly proven by the large volume of competitive government business we enjoy.

Write for Illustrated Catalogs and Complete Details

THE AMERICAN SCHOOL AND UNIVERSITY

EDISON GENERAL ELECTRIC APPLIANCE CO.

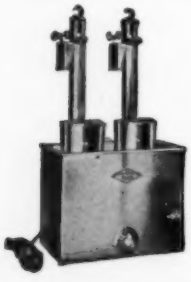
5600 West Taylor St.
Chicago, Ill.

Put Your KITCHENS ON A Scientific Basis

Only one form of cooking heat is worthy of school use. It is the heat which is clean, dependable, fast. It is the heat which is scientifically accurate and correct. It is efficient Calrod heat, possible only in General Electric Edison kitchen equipment.

Edison Electric cooking and baking installations are economical, not merely in operation, but in saved time, uniformity of result, and better food flavor. Vegetable minerals and vitamins are retained, and diets hold their natural food coloring. Health-giving elements lost in ordinary boiling, nourishing juices that bleed away in flame roasting, remain to tempt students' appetites.

Automatic temperature control, with which all Edison installations are equipped, eliminates kitchen guesswork and assures correct cooking heat. With current actually on only a fraction of cooking time, you gain not only the economy of low operating cost, but the saving that comes with exact certainty of method.



This Automatic Egg Boiler, thermostat-controlled, cannot burn out. Current shuts off automatically when water boils dry. Use your old timers if you desire

This Utility Range is especially adapted for diet kitchens or for small hospital kitchens, where saved space is a requisite. It requires no extra ventilation

EDISON GENERAL ELECTRIC APPLIANCE CO.

5600 West Taylor Street, Chicago, Illinois

THE AMERICAN SCHOOL AND UNIVERSITY

***Features* like these put your kitchen on a scientific basis. Ask your kitchen equipment jobber. Or write us—**

EDISON

This Horizontal-Type Broiler produces 36 two-pound steaks per hour. Convenient and clean

The Ad-A-Deck Bake Oven bakes at 3 different temperatures at once. Used by many thousands of professional bakers

This Roasting Oven pays for itself in less meat shrinkage. The oven shown has one deck added

This Heavy Duty Range has cooking surface of twenty-four square feet with four hot plates, each separately controlled. The Calrod units are practically indestructible

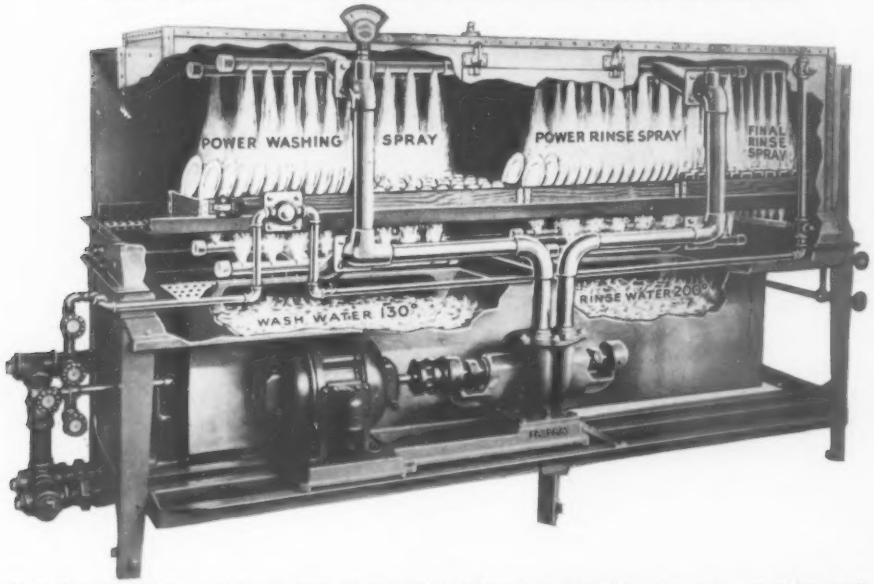
This Automatic Counter Fry Kettle turns out delicious perfectly fried foods, with savings in food and fuel cost

FASPRAY CORPORATION

PLANT AND GENERAL OFFICES

Red Bank, N. J.

FASPRAY DISHWASHING MACHINES



This Phantom View of the Faspray Two-Tank Dishwashing Machine, shown in operation, will convince you that the Two-Tank principle offers the only CORRECT cycle of dishwashing operations necessary to produce clean—bright—sterilized—dry dishes

THE Faspray principle is a distinct advance over ordinary methods, since it is based upon the test-proven fact that **two temperatures** are necessary in a dishwashing machine.

Water above a certain temperature (130° Fahrenheit) destroys the cleansing (cutting) effect of any washing compound. Greases and egg stains on dishes, instead of being removed when subjected to water at these higher heats, are actually baked on. Any manufacturer of washing compound will tell you that a temperature no higher than 130° is necessary during the washing operation.

After the dishes are washed the next function of the dishwashing machine is to rinse them. Effective rinsing can only be done at a temperature of approximately 180°.

These two distinctly different temperatures—130° for washing and 180° for rinsing—can only be maintained in a Faspray, because the Faspray is the only dishwashing machine in which the washing tank and rinsing tank are entirely **separate,** temperature controlled, with a special overflow drain design that effectually removes all floating refuse material from the tank.

In the average dishwashing machine, the water from the rinse, overflows into the wash tank, and from the wash tank into the drainage system. Naturally, before the machine has run very long, this overflowing causes the water in **both** tanks to become approximately the **same** high temperature, and by diluting (weakening) the strength of the washing compound, reduces cleaning efficiency to a marked extent.

The Faspray Overflow System (Patented), overcomes this difficulty completely and successfully. The overflow from the rinse tank is carried off directly to the drains. It cannot overflow into the wash tank, nor dilute the washing compound. And, this overflow system carries off the greasy wash water in the same manner.

In offering the Faspray principle of dishwashing—now recognized and established as the only **correct** method—Faspray Corporation maintain in their various models, the same high standards for which Faspray has long been famous—in design, in materials and in workmanship.

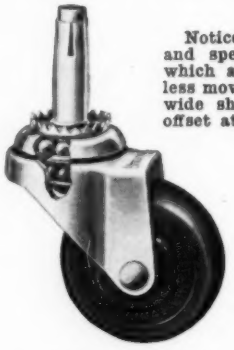
FAULTLESS CASTER CORPORATION

Dept. SU-36
Evansville, Indiana

BRANCH OFFICES IN PRINCIPAL CITIES — Canadian Factory: Stratford, Ontario

FAULTLESS DOUBLE BALL BEARING CHAIR CASTERS

In the office, the library, the study rooms, Quiet is a golden virtue. Faultless Casters are designed for quiet, smooth operation. Faultless Casters swivel quickly and with minimum effort. For the user, they make possible greater efficiency and contentment. Sturdy construction assures years of economical service. The special double ball bearing swivel caster featured here is finished in oxidized copper to harmonize with any furniture.



Notice the double row of polished and specially hardened ball bearings which assures quick swiveling, effortless movement and absolute quiet. The wide shoulder with center of gravity offset at such great distance from the wheel is another Faultless feature that makes for positive swiveling. Dust proof construction.

RUBBEREX (CUSHION TREAD) WHEELS, OXIDIZED COPPER FINISH

Style Number	Wheel Dia.	Height, Floor to Track Plate
2478	1⅝	2⅛
2479	2	2½

ROCKITE (HARD TREAD) WHEELS, OXIDIZED COPPER FINISH

Style Number	Wheel Dis.	Height, Floor to Track Plate
2778	1⅝	2⅛
2779	2	2½

FAULTLESS CUSHION CHAIR GLIDES

Faultless Cushion Chair Glides give double protection. The live rubber insulation protects against jars and vibration; the smooth rounded edges of the glide protect floors from being marred.

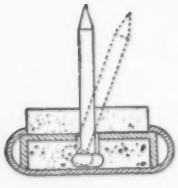
Faultless Cushion Chair Glides are offered in four sizes. They are sturdily built of formed hardened steel and will outwear the chairs on which they are used. They are finished in oxidized copper to harmonize with any style of furniture.

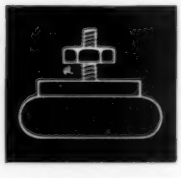
Made in Four Sizes:

NRS— ⅞" Diameter
NRS—1 1/16" Diameter
NRS—1¼" Diameter
NRS—1½" Diameter

Screw Type with Nut

SRS— ⅞" Diameter
SRS—1 1/16" Diameter
SRS—1¼" Diameter
SRS—1½" Diameter





Cushioned in Rubber

Notice the diagram showing the manner in which Faultless Cushion Chair Glides are constructed. The glide is braced by an inner steel frame, providing unusual strength. Live rubber inside the glide and at the top acts as a cushion and shock absorber, and permits the necessary flexibility which gives Faultless Cushion Chair Glides their long wearing qualities.

ROCKITE FURNITURE CUPS

Faultless Rockite Furniture Cups for stationary heavy furniture are made of a non-breakable, rust-proof composition, in a harmonizing brown shade that will not lose color. They protect floors and floor coverings.

Square Shape Cups

Style No.
SDC–1½" (Size of op'n'g)
SDC–1¾" (Size of op'n'g)
SDC–2" (Size of op'n'g)
SDC–2⅝" (Size of op'n'g)

Round Shape Cups

Style No.
RDC–1⅜" (Size of op'n'g)
RDC–1⅝" (Size of op'n'g)

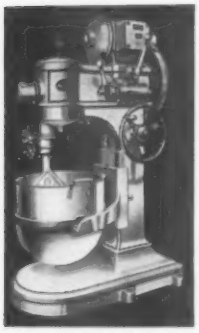
THE HOBART MANUFACTURING CO.

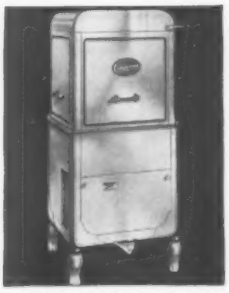
Makers of Electric Food-preparing and Dishwashing Machines

Troy, Ohio

New York Office, 45 E. 27th St., near 4th Ave. Chicago Office, 308 W. Randolph St.

SALES AND SERVICE OFFICES IN ALL PRINCIPAL CITIES Sold Through Leading Kitchen Outfitters





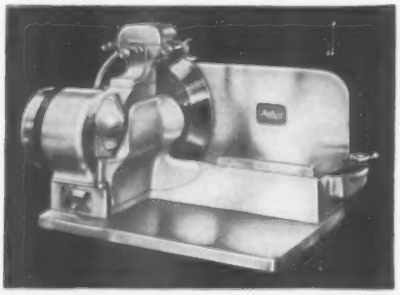
Hobart M-80 Super-Mixer with bowl capacity up to 110 quarts. Various sizes take the Air Whip attachment (see below)

At right, Hobart-Crescent AM-5 De Luxe Dishwasher with many advanced features

HOBART MIXERS are built in 3, 5, 10, 12, 15, 20, 30, 40, 60, 80 and 110-quart Bowl Capacities. A model for any size kitchen. They mix, beat, whip, blend, mash. With attachments they chop, grind, slice, shred, grate, crumb, sieve, strain, etc.

The Air Whip Bowl, or attachment, for Hobart Mixers only, now adds even more to the value of these machines. Supplies new aerating advantages important in cake making, improving texture, taste and keeping quality.

Hobart-Crescent Glass and Dishwashers are made in a wide range of automatic and semi-automatic models to meet the demand for any capacity. They give sparkling cleanliness and a high degree of sterilization. Noted for such exclusive features as revolving wash arms and patented Dual-Drive conveyor. Also complete line of Brush Type Glasswashers.

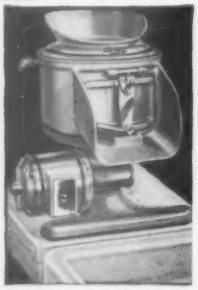


The newest design in Hobart Slicing Machines, the "Silver Flash." Latest in performance, speed, safety and sanitation. Low priced

The Hobart Electric Ball Bearing Slicing Machine combines the newest, most improved features in **one** machine. Ideal for boneless meats, raw or cooked, bread, cheese, vegetables, fruits, etc. Special Kitchen Feed Trough. The "Silver Flash" is a model of beauty, performance.

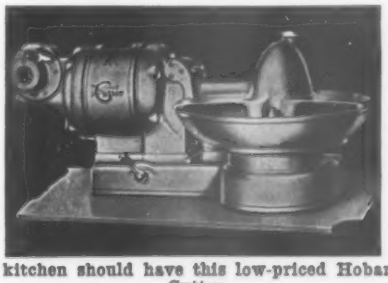
The Hobart Air Whip makes 3 or more quarts of whipped cream from 1 quart of liquid cream in a few seconds. Whips by **Air,** keeping all the freshness and sweetness of the cream. More and better whipped cream at less cost.

The New Hobart Air Whip revolutionizes cream whipping



Hobart Potato Peelers pay as they peel, quickly

Hobart Potato Peelers are made in 3 sizes, with capacities from 15 to 45 lbs. peeled in 90 seconds. Negligible peel loss. Can also be used for sweet potatoes, carrots, parsnips, turnips, etc.



Every kitchen should have this low-priced Hobart Food Cutter

Hobart Food Cutters, with latest features, cut meats, vegetables, fruits, nuts—practically anything in the food line, uniformly, in a few seconds' time.

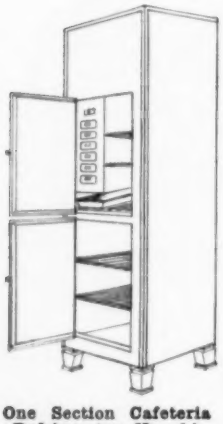
Guarantee and Service. Hobart Machines are built by the World's Largest Manufacturers of Electric Kitchen Machines—even to the motors. An advantage to the kitchen standardizing on Hobart Equipment is that all Hobart Machines are guaranteed and serviced by **one** nationwide organization. This saves uncertainty, inconvenience and confusion. Further particulars on request without obligation.

THE JEWETT REFRIGERATOR CO.

Buffalo, N. Y.

JEWETT is the oldest name in the refrigerator industry and has been making the finest refrigerators continuously for 85 years—since 1849. Many famous hotels, hospitals, clubs and schools are equipped throughout with JEWETT refrigerators, thousands giving satisfactory service today after three generations of constant use.

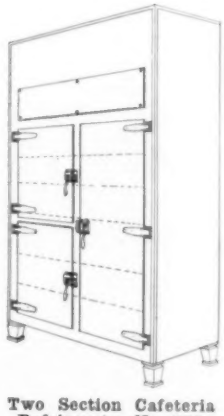
By careful planning in construction and design, JEWETT Refrigerators are now available in standard sizes to meet the definite requirements of School Cafeterias. These refrigerators are furnished complete with the refrigeration mechanism, mounted on top of the refrigerator and concealed by front and end panels, or located on the floor, or below the refrigerator. In the case of Models 59 and 399, the cooling coil is located in the upper section across the top. Model 14 is equipped with an ice cube making coil in the upper left hand section. These refrigerators are available in several standard finishes: Stainless steel, Porcelain or Wood exterior; interior linings are of stainless steel, porcelain or galvanized iron.



One Section Cafeteria Refrigerator No. 14

JEWETT specializes in refrigerators of any type and drawings and specifications will be sent promptly without obligation, upon receipt of a rough outline of the requirements.

Three Section Cafeteria Refrigerator No. 59 Porcelain Interior and Exterior



Two Section Cafeteria Refrigerator No. 399

Our 85 years of experience and careful research have prompted changes in design and construction from time to time and every modification has been thoroughly tested and demonstrated to be positive value before final adoption.

Plan to consult us now on your refrigerator problems and send for our complete catalog.

THE LAWRENCE COMPANY

Pure Wool Blankets

170 Summer Street

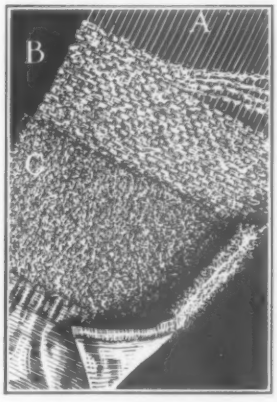
Boston, Mass.

Telephone: Liberty 9032

THE SWORMA BLANKET

For College Dormitories and Educational Institutions

Combining Beauty of Texture and Long Life with Moderate Cost



Analysis

All Wool Weft (for warmth) 83.9%
Real Silk Warp (for strength) 14.9%
Dye, etc. (for beauty) 1.2%

This Blanket has been thoroughly washed with soap and shrunk in the process.

Colors:

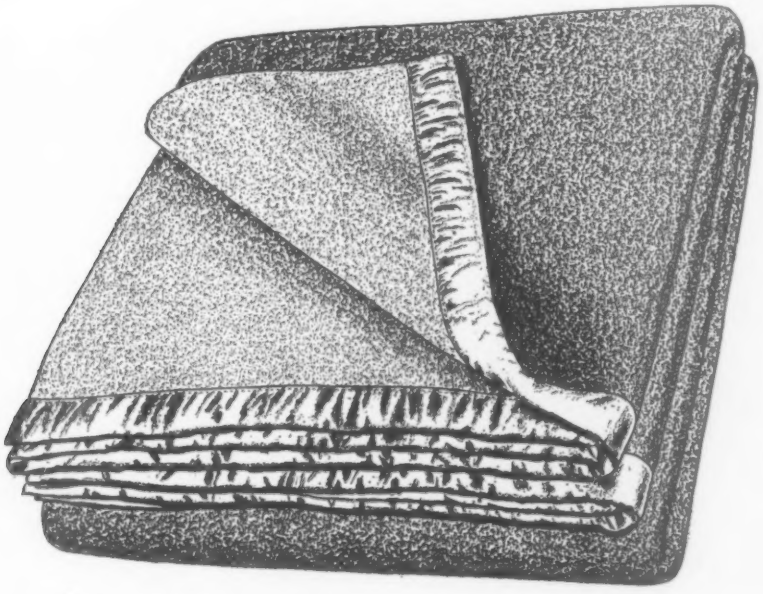
Blue	Orchid	Peach
Rose	Green	Heather

(Four-inch Silk Satin Binding)

One Size only:
70″ x 80″

Write us for sample Blanket or swatches, also quotations.

Warp threads, hidden deep in the heart of the blanket, cannot be napped. By using SILK threads (A) in the warp, we secure unusual strength, and the slender silk leaves room to crowd MORE WOOL (B) (actually 85% of the blanket) into the weft, making MORE NAP (C), giving you MORE WARMTH.



M. REISCHMANN & SONS INC.

Manufacturers

SCHOOL — LIBRARY — *and* CHURCH FURNITURE

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The application of Enduro, Republic's Perfected Stainless Steel, in schools and universities, relates to (a) its use as a decorative medium, exterior and interior, (b) its use wherever food comes into contact with metal, as in kitchen and cafeteria equipment, and (c) its use in laboratory service, in furniture and in vent hoods and ducts.

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The facilities of the largest and best equipped metallurgical laboratories in America, together with the experience and skill of a trained corps of Republic Metallurgists and Engineers, are at your service in working out any problem relating to the use of or fabrication of Enduro. Tell us your problems.

1. Union Entrance of the University of Minnesota, St. Paul, Minn., fabricated of ENDURO by Stanley Iron Works, Inc., Minneapolis, Minn.

2. ENDURO-equipped cafeteria, fabricated by John Van Range Co., Cincinnati, Ohio, and installed in Lane Technical High School, Chicago, Ill.

3. All equipment in the cafeterias in both the junior and senior divisions of the Louisville Girls High School in Louisville, Ky., is ENDURO. Fabricated by the Stearnes Company, Chicago, Ill.

4. A beautiful stainless staircase of ENDURO.

5. Toilet partitions in St. Colman's Parochial School, Watervliet, N.Y., are stainless, easy-to-clean ENDURO. Fabricated by Harvey B. Kimmey, Albany, N.Y.

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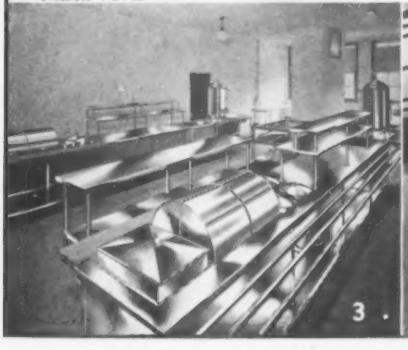
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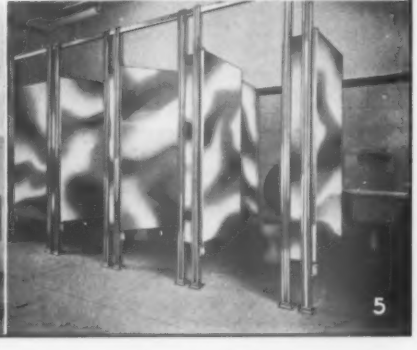
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▲ Home recipe pickles, relishes and conserves from Sexton Sunshine Kitchens—delicious and appetizing.

▲ Carefully selected coffees—blends resulting from years of careful study—roasted fresh daily at Chicago and Brooklyn.

▲ Special quotations based on major purchases of exclusively institutional merchandise—sharing with you the advantages of a greater buying power.

THE AMERICAN SCHOOL AND UNIVERSITY

JOHN E. SMITH'S SONS COMPANY

50 Broadway, Buffalo, N. Y.

Manufacturers of "BUFFALO" Food Cutters, Meat Choppers, Vegetable Slicers and Bread Slicers

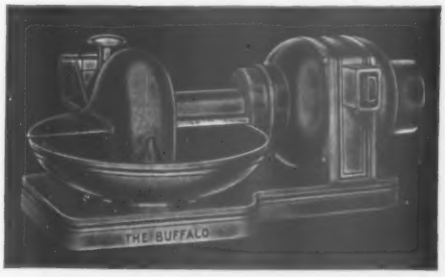
(*Left*) New Model 120 "BUFFALO" Self-Emptying Food Cutter

Model 120 is a perfect machine for large school kitchens. Chops all kinds of meat, fruit, vegetables, nuts, fine without mashing or squeezing out nutritious juices. The bowl is emptied automatically without touching the food. Produces better quality chopped foods, eliminates food waste, saves considerable time and labor. Simple, safe, sanitary. Easily cleaned.

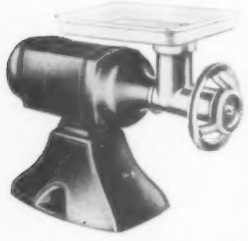
Diameter of bowl, 20 inches. Capacity 20 lbs. of meat. Top plate can be removed; bowl not removable. 1 H. P. fully enclosed motor.

Both models 120 and 114 can be furnished with grinder or vegetable slicing attachments. "BUFFALO" Choppers also made in 4 other sizes. Write for complete catalog and prices.

(*Right*) Model 114 "BUFFALO" Food Cutter



Model 114 is ideal for use in school kitchens. It is sturdily built, takes very little room; beautifully finished. Has exclusive safety features: knives fully guarded; top plate and bowl removable. Has capacity of 7 lbs.; ⅓ H. P. motor.



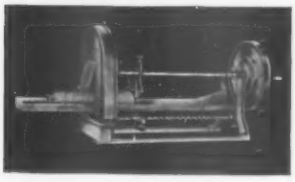
(*Left*) New "BUFFALO" Meat Chopper

A new machine built along modern, improved lines; assures fast, clean-cut operation with no clogging, backing up or mashing of meat. Specially designed feed screw, knives and plates of highest grade materials. Produces finest quality hamburger and other chopped meats.

Five sizes. Equipped with open throat or porcelain tray. Model 412: Capacity 3 lbs. meat per minute. ¼ H. P. motor. Write for special catalog and prices.

(*Below*) "BUFFALO" Bread Slicer

Automatically feeds the bread to the knife. Cuts 175 to 200 uniform slices per minute. Stacks as it cuts, keeping the bread fresh. Saves two to three slices on every loaf over hand slicing. Made in three sizes, hand or motor operated.



(*Above*) Model C "BUFFALO" Vegetable Slicer

Used for slicing all kinds of vegetables and fruits; grating cheese, bread crumbs; making French fried, Julienne potatoes; slicing or grating nuts. Makes uniformly thin potato chips. Can be equipped with five slicing disks and two different style fronts; also with grinder for producing fine cut hamburger, sausage meat, etc. ⅓ H. P. motor.

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100%

BY

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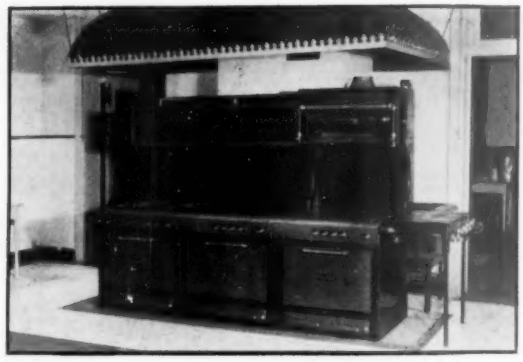
GAS EQUIPMENT



A typical school installation, St. Elizabeth's Home, West Hartford, Conn. No matter how large or small the school, VULCANS will fit it just right

VULCAN NO. 4751 All-Hot-Top Gas Range

The standard heavy-duty type range. Fast, economical, easy to operate and keep clean. Open or closed top, oven, insulation, heat control and salamander broiler are optional.

Several Models and Sizes

At Right: **VULCAN No. 4712 Junior Gas Range.** *Has same construction and features as heavy-duty, but it is smaller in size. Takes less floor space*

At Extreme Right: **VULCAN No. 3761T Insulated Bake Oven** *with Heat Control for bread, pies, pastries, cake, macaroni, potatoes, puddings, etc.*

VULCAN EQUIPMENT MAKES GAS THE MODERN EFFICIENCY FUEL . . . CLEAN, FAST AND ECONOMICAL

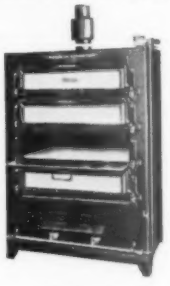
WHAT is the secret of wholesome, appetizing low-cost school meals? Careful selection of foods? Yes, but that is not all . . . they must be properly cooked. The VULCAN All-Hot-Top Range with its great number of cooking heats and the VULCAN Bake Oven with its controlled heat make it easy for any cook to get results that are desirable.

Low costs are made possible by the VULCAN'S aerated burners, insulation, heat control and other patented features . . . and gas, the low-cost dependable cooking fuel. All VULCAN Equipment A-G-A approved.

Ask for Catalog and List of School Installations

VULCAN NO. 4712

VULCAN NO. 3761T



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UNIVERSAL EQUIPMENT COMPANY

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Batesville, Indiana

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STUDENTS' QUARTERS
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To the institutions of America we offer a complete line of fine furniture. Our furniture is correctly built and designed by experienced workmen to combine strength with beauty and comfort. Let us know your requirements.

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We will furnish your institution with furniture that will harmonize with its interior or exterior architecture, with no penalty in price. We possibly can offer helpful suggestions for complete jobs or individual items.

WE BUILD ANY KIND OR STYLE
OF INSTITUTIONAL FURNITURE

THE AMERICAN SCHOOL AND UNIVERSITY

R. WALLACE & SONS MFG. CO.

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Quality, reliability and design have always been judged of maximum importance by the Wallace organization since 1835 . . . one hundred and one years ago. The restaurant and hotel patterns shown here have reaped the advantages of this experience and of such a policy.

BERKSHIRE PATTERN

5 OZ. PLATE . . . SECTIONAL

Heavy 18% nickel silver blanks. Weight of Tea Spoons, 9¼ lbs. per gross. Plated with pure silver on basis of 5 oz. per gross of table spoons—other pieces in proportion. Staple pieces are visibly sectionally plated (more silver applied at points most exposed to wear).

List price, Tea Spoons, per doz. $1.98

HALF-STANDARD PLATE WITH OVERLAY

Heavy 18% nickel silver blanks. Weight of Tea Spoons, 9¼ lbs. per gross. Plated with pure silver on basis of 2½ oz. per gross of table spoons—other pieces in proportion.

List price, Tea Spoons, per doz. $1.71

NORMAN PATTERN

5 OZ. PLATE . . . SECTIONAL

Extra heavy 18% nickel silver blanks. Weight of Tea Spoons, 10½ lbs. per gross. Plated with pure silver on basis of 5 oz. per gross of table spoons—other pieces in proportion. Staple pieces are visibly sectionally plated (more silver applied at points most exposed to wear).

List price, Tea Spoons, per doz. $2.80

CHOATE PATTERN

5 OZ. PLATE . . . SECTIONAL

Extra heavy 18% nickel silver blanks. Weight of Tea Spoons, 10½ lbs. per gross. Plated with pure silver on basis of 5 oz. per gross of table spoons—other pieces in proportion. Staple pieces are visibly sectionally plated (more silver applied at points most exposed to wear).

List price, Tea Spoons, per doz. $2.80

ANDOVER PATTERN

TRIPLE . . . SECTIONAL

Extra heavy 18% nickel silver blanks. Weight of Tea Spoons, 11½ lbs. per gross. Plated with pure silver on basis of 12 oz. per gross of table spoons—other pieces in proportion. Staple pieces are visibly sectionally plated (more silver applied at points most exposed to wear).

List price, Tea Spoons, per doz. $5.20

AA . . . SECTIONAL

Extra heavy 18% nickel silver blanks. Weight of Tea Spoons, 11½ lbs. per gross. Plated with pure silver on basis of 6 oz. per gross of table spoons—other pieces in proportion. Staple pieces are visibly sectionally plated (more silver applied at points most exposed to wear).

List price, Tea Spoons, per doz. $4.00

For samples and discount from above prices write to your jobber . . . or direct to the nearest Wallace sales office. Other flatware patterns are made in a variety of grades—also hollow ware. Ask for complete Catalog No. 136-N.

Section VIII

LABORATORY

The New Chemistry Laboratories of the College of Arts and Sciences, Georgetown University

BY LAWRENCE C. GORMAN, S.J.
DIRECTOR OF CHEMISTRY

THE Chemistry Laboratories of Georgetown University, Washington, D. C., occupy the top floor of the new White-Gravenor Building. The building is in the form of an L, 200 feet frontage, 100 feet deep at one end, and about 60 feet deep at the opposite end. It is constructed of stone, brick and cement, and is fireproof.

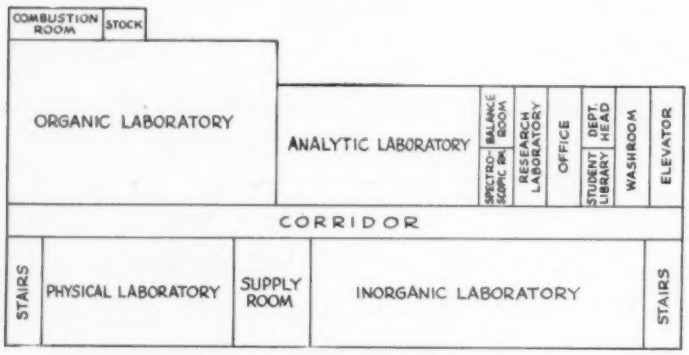
In the front of this building on the fourth floor are the inorganic laboratory, the supply room, and the physical laboratory. In the rear section of the same floor are the organic, analytic and research laboratories, a combustion room, a balance room, a spectroscopic room, administration offices, a students' chemistry library, a students' lavatory and a freight elevator. The inorganic laboratory contains 300 individual lockers, and has a capacity of 100 students at a time. The analytic laboratory has 96 lockers, with table space for 48 students at a session. The organic laboratory has 140 lockers, with desk space for 70 students. The physical laboratory will accommodate 38 students.

Three considerations were kept in view in planning these laboratories—ventilation, illumination and convenience.

Ventilation

All the laboratories are provided with two systems of ventilation; the first supplies fresh air, and the second removes noxious gases. To supply fresh air, air-conditioning and heating units are used. An electric fan connected with an outside duct draws in fresh air over steam-heated pipes. The warmed fresh air is forced into the laboratories, circulates, and passes out through wall vents to the roof. The temperature is automatically controlled by individual thermostats in

THE WHITE-GRAVENOR BUILDING AT GEORGETOWN UNIVERSITY, HOUSING THE NEW CHEMICAL LABORATORIES



FLOOR PLAN OF THE LABORATORIES

each laboratory. If the temperature of the laboratory rises higher than the thermostat setting, the heating unit is shut off, but the fan continues drawing fresh air in from the outside. In two years of operation these units have given no trouble and have proved very satisfactory.

To remove noxious gases, emergency exhaust fans are located in each laboratory. They are hung from the ceiling and are designed to evacuate the laboratory completely in about five minutes. They draw gases which are lighter than air directly into the blower, and exhaust gases heavier than air through large vents placed in the side walls at floor level.

Hoods are placed at the ends of each laboratory. They have an oak base fitted with cupboards and doors, soapstone table tops, asbestos composition fume chambers and wire-reinforced glass-front windows. The interior of the hoods is illuminated by electric lights set in special resistant receptacles. Water, gas and steam service in the hoods is controlled from the outside and may be regulated when the windows of the hoods are closed. The exhaust blowers and motors are located above the hoods, and separate metal exhaust ducts lead directly to the roof. In the analytic laboratory, in addition to the above services, there is a metal cylinder of hydrogen sulphide in the cupboard beneath the hoods. This cylinder is fitted with a special pressure and regulating gage. The gas is led from the gage through hard-rubber pipe and valves to hard-rubber outlets in each hood.

Since the laboratories are on the top floor, additional daylight illumination is obtained from skylights placed in the ceilings of the laboratories. The skylights are all vented along the sides, and besides affording an abundance of daylight, help to keep the air in the laboratory fresh. Artificial illumination is provided by a sufficient number of drop-lights from the ceiling. The 15-inch diameter globes are tinted a blue-white and produce an effect almost like daylight.

Convenience

It is axiomatic, of course, in planning a laboratory to locate the supply room centrally. A glance at the schematic outline shows that the supply room at Georgetown is conveniently near all the laboratories. Doors in this room open directly into the inorganic and physical laboratories, and a door opening into the corridor is convenient to the organic and analytic laboratories.

In the supply room are a sufficient quantity of all the commonly needed pieces of apparatus, a preparation table with an independent electric still, in case the main steam-operated still should fail, and first-aid emergency equipment. Directly above the supply room, and connected to it by an iron ladder and elevator, is the main storage room. This runs the depth of the building, and provides ample storage space for our needs. Stock is kept in open steel bins, one section of which is assigned to ordinary glassware, another to special glassware, a third to non-glassware, and a fourth to non-corrosive chemicals. Corrosive and dangerous chemicals, together with all acids, are stored separately in a special room.

THE INORGANIC LABORATORY

Directly beneath the supply room and connected to it by the same elevator that runs to the storage room, is a chemistry lecture room. This arrangement facilitates the transfer of chemicals and demonstration apparatus from either storage or supply rooms to the lecture

room. Across the corridor is another chemistry lecture room with a capacity of about 175 students. Both of the lecture rooms are equipped with large demonstration tables serviced with gas, water, sinks, and A.C. and D.C. electricity.

In all the laboratory tables, the lockers and drawers are oak, the tops are maple. We chose wood tops in preference to soapstone because our experience has proved to us that wood, if given a little care, makes a most satisfactory top. Our old wooden laboratory tops, treated with acid-resisting aniline black and an occasional coating of linseed oil, were still giving satisfactory service after 25 years. The tables are equipped with lead-lined center troughs emptying into soapstone sinks at the end of the table. The lockers are furnished with combination locks—which have eliminated the irritation of lost and forgotten keys. Service outlets are coated with a bronze chemical-resistant finish.

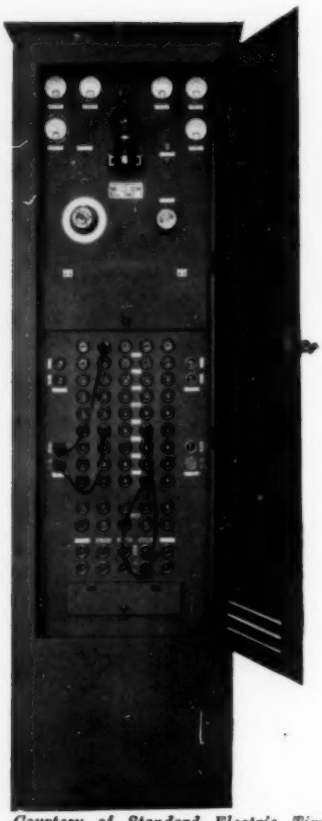
THE ORGANIC LABORATORY, SHOWING SKYLIGHT ILLUMINATION

THE CHEMISTRY LECTURE ROOM

The service supplied to these tables depends on the type of work to be performed on them. In the inorganic laboratory all tables are serviced with gas and water. In the analytic laboratory gas, water, and A.C. electricity are supplied. The organic laboratory has gas, water, A.C. electricity and steam. The physical laboratory, in addition to the last four services, has also D.C. electricity, which may be accurately controlled by means of a resistance box permanently mounted on the reagent shelf over each student's work space. The source of this direct current is a storage battery and motor generator panel board outfit built to specifications. From this panel board any D.C. voltage from 2 to 130 volts may be plugged in, and a sufficient number of circuits are available from the panel to supply a source of current to four tables in the physical laboratory, to the two lecture rooms, and to the analytic laboratory.

A few features of the organic laboratory may be worth mentioning. One is the presence of an instructor's demonstration table, placed on a raised platform at the end of the laboratory, and similar to the lecture tables in the chemistry classrooms. It has a large blackboard behind it and plenty of free space in front. Frequently, in an undergraduate organic laboratory, the instructor wishes to give specific warnings, directions and explanations. Occasionally too, he wishes to set up a piece of apparatus as a model to the class. This table in the laboratory has been constantly used for such purposes. Another feature of the organic laboratory is the permanently mounted steam-heated water baths. They are conical, of copper, large enough to hold a one-

THE ANALYTIC LABORATORY, SHOWING AIR-CONDITIONING AND HEATING UNIT UNDER WINDOW



Courtesy of Standard Electric Time Co.

DIRECT CURRENT PANEL BOARD IN THE PHYSICAL CHEMISTRY LABORATORY, GEORGETOWN UNIVERSITY

liter distilling flask, and are fitted with an extra steam outlet for use in steam distillations.

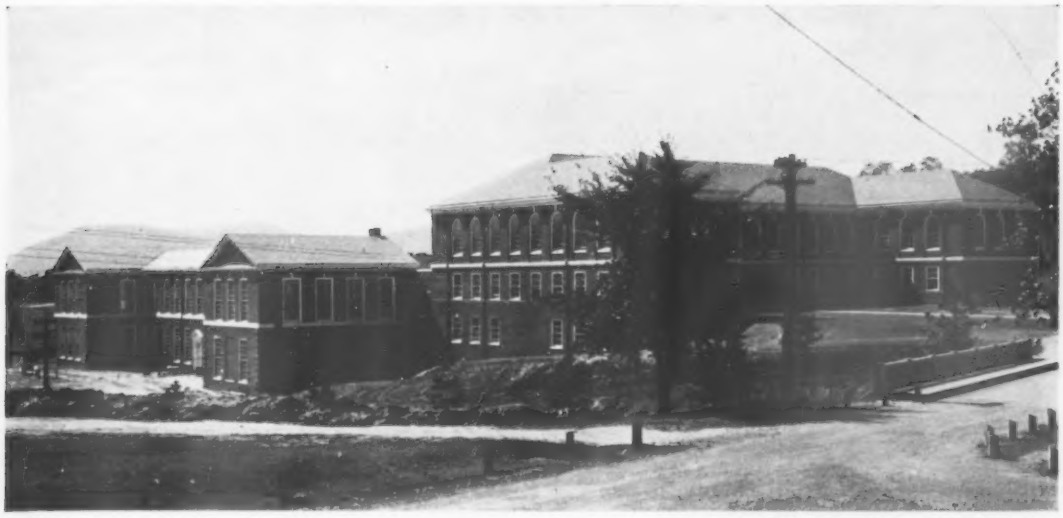
The cement floors are covered with an asbestos composition tile, each tile about one foot square. If a section of this covering becomes damaged, the damaged squares can be removed and easily replaced with new squares. Up to the present this floor covering has proved remarkably immune to laboratory hazards. On different occasions, about 500 cc of concentrated sulphuric acid and the same amount of a strong solution of potassium hydroxide have been spilled accidentally on the floor and remained there over night with no apparent damage to the floor covering.

All plumbing is exposed, and all waste pipe is of acid-resisting material. Distilled water is supplied to each laboratory through blocked tin pipe from a steam-heated still in a separate room in the attic. The service piping is so arranged that expansion of present laboratory facilities can be made with a minimum of labor and expense. In fact, recently a large room on the third floor was so equipped for the furtherance of our chemo-medical research work.

The architect of the building was Emile Perrot, of Philadelphia, and the laboratories were laid out after consultation with the staff of the Chemistry Department.

AUTHOR'S NOTE. For best American practice in laboratory construction, let me recommend "A Report of the National Research Council Committee on the Construction and Equipment of Chemical Laboratories," published by the Chemical Foundation of New York. George L. Coyle, S.J., former Head of the Chemistry Department at Georgetown, was Chairman of the Committee at the time the Report was published.

For recent European practice, I recommend the perusal of a profusely illustrated 266-page book entitled, "The New Laboratory of Physical Chemistry at Upsala University, Sweden," by Yngve Bjornstahl, member of the staff of Upsala.



THORNTON HALL, UNIVERSITY OF VIRGINIA, AS SEEN FROM THE MAIN CAMPUS

The New Engineering Building at the University of Virginia

BY W. S. RODMAN

DEAN OF ENGINEERING, UNIVERSITY OF VIRGINIA

THE new center for instruction in engineering at the University of Virginia, Charlottesville, open for use at the beginning of the 1935-1936 session, is named Thornton Hall, in honor of the first Dean of Engineering at Virginia, William Mynn Thornton, whose active service spanned 55 years, from 1875 to 1930.

The building plans were perfected by the Architectural Commission of the University upon a skeleton plan for service needs prepared by the teaching staff of the Department of Engineering. The Commission was particularly fortunate in its finished plan in securing two important essentials: harmony with the well-known Jeffersonian architecture of the rest of the University; and at the same time fitness for service as a working home for the activities in class and laboratory of a department concerned with engineering instruction of a professional character.

The Setting of the Building

The site selected, at the southern end of the main campus, on McCormick Road, affords a pleasing outlook on all sides and secures an unencumbered abundance of light and air for the working areas. The building is designed to accommodate comfortably a student body of 300, normally distributed in the several years of the course, and it is expected that the matriculation in engineering will be restricted to that approximate number, in the belief that it affords an ideal group for the University to train in its engineering school.

The building is in a sense three interconnected structures arranged in U-fashion, with a central grass court 150 feet square, closed at the top of the U by an arcaded walk which furnishes ready access between the two wings. The main unit of the group consists of basement and two upper floors; the western wing is of one-story, and the eastern wing of two-story, construction, each unit being approximately 300 feet long.

The entire building is erected upon reinforced concrete foundations with the walls of over-size brick of a color to match other campus structures, and is of a simple, dignified design most pleasing from every aspect. Cast stone bands, with the same material as a part of door and window trim, serve to relieve the severity of extensive uninterrupted areas of brick. The arcade motif is used throughout the construction rather than the colonnade, which is a feature of many of the earlier buildings on the campus. Reinforced concrete floors are the rule; partitions of brick, tile or gypsum block predominate, and the slate roof is supported on structural steel trusses.

Floors vary from those of concrete in most of the laboratories, through terrazzo in corridors, to mastic-covered concrete in offices, classrooms and library. The classrooms and offices have plastered walls and sound-absorbing ceiling surfaces, while

the walls of most of the laboratories and drawing rooms are of painted brick. Basement corridors and lavatories are finished in general with glazed tile walls to a height of about 6 feet. Throughout the building generous window allotment has been secured to insure ample natural light and ventilation.

Heating and Illumination

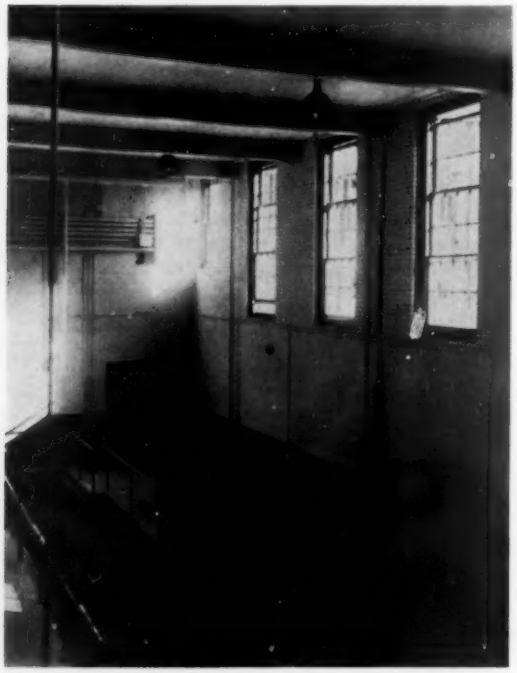
The entire building is heated from the central heating plant of the University, which provides a circulating hot-water system, with radiators wall-supported to aid in maintaining cleanliness. The building's water supply is obtained from the main service of the University. All laboratories are piped for the necessary water supply, electric water heaters provide essential service to lavatories, and electric coolers in strategic locations make available a ready supply of cool drinking water. All laboratories which have use for gas are piped for that service from the city mains.

The problem of adequate artificial illumination for all purposes was given careful attention, and as a result the planned illumination will be in accord with the best modern practice. An ample arrangement of panel boards with heavy mains together with a finely divided individual control of circuits provides a flexible and entirely adequate system suited to the several uses made necessary in such an all-inclusive structure. Semi-indirect and totally indirect lighting is utilized in most locations, with such a variety of lighting units as will serve both to provide essential illumination and at the same time be an ex-

VIEW IN THE POWER LABORATORY IN THE WESTERN WING

emplification of several means of obtaining approved illumination of required intensity but free from glare. Incandescent units ranging in size from 100 to 1,500 watts are in the main utilized. A single installation of modern mercury-arc units is applied, however, in the repair shop.

In connection with the electrical system, care has been taken to supply, wherever requisite, an ample number of convenience outlets, so that electric fans, projection apparatus, etc., may readily be connected when needed. Interior communication will be afforded between various parts of the building by an intercommunicating telephone system of some 40 stations. A number of electric clocks are installed, and class periods will be announced on an electric program service reaching every portion of the building.



A PORTION OF THE HYDRAULICS LABORATORY IN THE BASEMENT OF THE CENTRAL UNIT

Interior Arrangement of Central Unit

The central unit of the group is entered from the main walk through an arcaded entrance leading to the lobby in which the main bulletin boards are placed. From this open lobby the main corridor extends in both directions, giving access at each end by stairways to the upper floor level and also by stairways downward to the basement and connecting passageways to the other two units of the building. Arranged along the main corridor are eleven offices for ten professors and the secretary to the Dean, which overlook the central grass court, and in each of which modern steel office equipment is installed.

From the main corridor, across from the offices,

LOOKING DOWN AN ARCADE FROM THE CENTRAL UNIT TO THE AERONAUTICS LABORATORY IN THE EASTERN WING

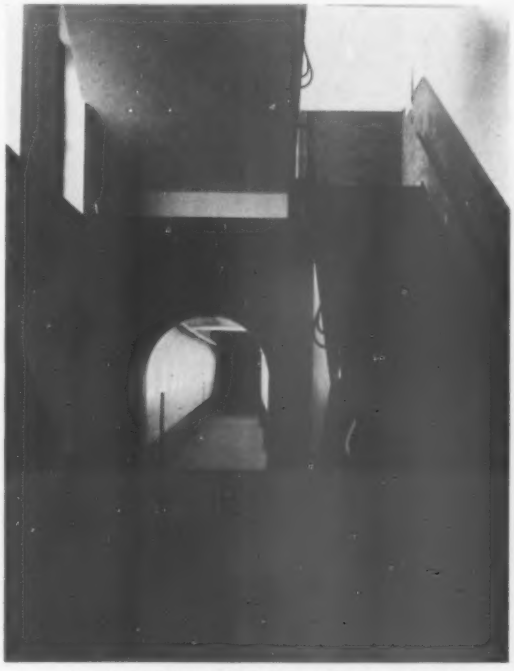
are three classrooms and a Faculty conference room. Side corridors lead to six other classrooms, to which access is also possible through two side doors from the front plaza. The Faculty conference room is equipped with a conference table and the necessary chairs. Seven of the classrooms will seat 30 students each, and one larger room is arranged to seat 56. These eight rooms are equipped with individual swivel chairs arranged with table tops on pedestals in front of each row of chairs. The remaining large classroom is equipped with 77 tablet-arm chairs arranged radially. All classrooms are furnished with ample blackboards covering all available wall space, besides bulletin board and special lecture desk. This floor is completed by two small lavatories, one at each end of the office suite, reserved for use of the Faculty and for ladies respectively.

The upper floor of this unit is devoted to the library and drawing rooms for the Department. The library is directly above the offices and will constitute a combined library and reading room. This handsome room is pleasingly furnished in oak panels and trim, and is equipped with oak reading tables and substantial chairs. Steel stacks house the present engineering library of some 5,000 volumes, and adequate space is available for growth of the collection. A librarian's office adjoins the library proper, and an additional office for drawing instructors completes one end of the floor. At the opposite end of the reading room are two small rooms which contain the blueprinting, mimeographing and photostat equipment for the Department, with a dark-room attached.

The remainder of this floor is assigned to drafting rooms, space being available for something over 150 individual drawing tables and the accessory files. For the present, 108 drawing tables are in place, 78 in one main group for first-year students principally, with two smaller groups of 15 each in partitioned rooms for more advanced classes. The drawing tables are specially built and provide adjustable tilt tops 3 by 4 feet in area; each table is equipped with two drawers, each drawer being supplied with individual combination, master-keyed padlocks. Steel stools, with wooden seats, are supplied for each table. The planned artificial illumination for the drawing room is 30 foot-candles on the working surface. For the present the unoccupied space, later to be equipped with additional drawing tables, will be used as a temporary auditorium, using folding steel chairs, where the entire student group may assemble for lectures and general meetings.

The Basement of the Central Unit

The basement floor of this unit is occupied in the front by one large and four smaller storage rooms and the main locker-room and lavatory. More than 200 individual steel lockers, supplied with combination, master-keyed padlocks, are installed here. The sanitary arrangements of the lavatories are of the best modern type. The inner section of this basement will be used by three experimental laboratories. The largest is that for hydraulic testing. This laboratory has adequate



A STUDY IN STAIRWAYS AND CORRIDORS

headroom and is provided with a built-in trench extending its entire length. Here are assembled the various pumping units, high- and low-pressure, electrically driven and controlled; apparatus for flow experiments; weirs, tanks, scales, meters, etc., with the essential auxiliary apparatus necessary for successful hydraulic testing of motors, pumps and systems.

A second laboratory on this floor is that for testing fuels and oils. This is supplied with gas, water and electricity and in its equipment are calorimeters for solid, liquid and gaseous fuels; electric-muffle furnace, electric drying oven, sample grinder and crusher, pyknometers, balances, crucibles, etc. Here also are found flash and chill testers, hydrometers, viscosimeters, etc., used in determining the properties of oils. The third of these laboratories is for cement testing. It is completely equipped for making tests of cement, cement aggregates, and concrete. It has tensile testers, compressometers of several types, tools for shearing test, steaming oven for accelerated tests, drying ovens with automatic temperature regulation, moist-air closets, sieves, molds, and the necessary small apparatus required in these tests.

The One-Story Western Wing

The western wing is devoted mainly to three additional laboratories of experimental engineering. One of these is to be used for road materials testing. It is equipped with abrasive machine, ball mill, molding press for briquetting, impact cementation tester, toughness tester, rock crusher and brick rattler, compression tester, diamond core drill, diamond rock saw, grinding lap, Westphal balance, specific gravity apparatus and sets of sieves. For bituminous road materials there are a penetrometer, ductility machine, viscosimeters, extractor, oil tester, pyknometers, flow plates, gas and electric hot plates, and accessory apparatus for testing bituminous road binders.

The second laboratory in this wing is the power laboratory. Here are found the units for steam and gas power testing; steam boiler, steam engines, turbines, gas engines, condensers, air compressor, and auxiliary equipment such as indicators, thermometers, gages, planimeters, standards for their calibration and correction, Orsat apparatus, calorimeters, etc. In addition to the above, the complete boiler equipment of the University boiler plant is available for student tests.

Also in this group is the structural materials laboratory. Here are placed standard machines for tensile, compressive and transverse tests of both metals and wood; torsion machine, impact testing machine, fatigue test machine, scleroscope, wire testing machines; extensometers, compressometers and tools for shearing tests of metals and timber. On a mezzanine are an office and an apparatus room. An office for the instructing staff in surveying is located in this wing, and directly connecting with it is the instrument room for surveying classes. This equipment includes compasses, transits and levels of various makes, hand levels and clinometers, plane tables, sextant, leveling rods, telemeter rods, signal poles, chains, tapes, pins and so on. For hydraulic surveys there are hook gage and current meter. The facilities of this wing also include a locker room and lavatory easily accessible. A spacious student lounge containing chairs, tables, lounges, bookstacks and magazine racks completes this wing.

The Two-Story Wing

The ground floor of the two-story wing is devoted entirely to the electrical engineering laboratories. The main room will be used for dynamo-machine testing and has the building power plant at one end. The electrical supply is at present secured from the Public Service Company, and the needs of laboratories and building are taken through transformers and motor-generator sets. The dynamo laboratory is well supplied with test units of moderate size, of various makes, and of the general types usual in service, both direct and alternating current. All test units are direct-driven, and all connections are made by universal plug and receptacle connections with flexible cords. Individual control panels are placed at convenient points throughout the laboratory, and their supply is by conduit embedded in the floor structure. Brakes are furnished for each motor unit, and a complete supply of instruments is at hand for all tests. Transformers of various types, induction regulators, control resistances, inductances and capacitances are included in this equipment. Mercury arc rectifiers, arc welding sets and numerous other units supply additional test service. Oscillographs, single and multiple, make possible a wide variety of tests of transient phenomena. An office for the laboratory instructor, and a large instrument room, adjoin the machine laboratory. As a part of the electrical supply system, there is the transformer room, which houses also the main circuit breakers and voltage regulators. A storage battery room is closely adjacent, and a dark-room for photographic developing is included.

Moreover, there are three additional laboratories in the electrical division. One of these is the standardizing laboratory, which is supplied with the usual electrical standards necessary for testing and calibrating portable test instruments. Here are included also several instruments of high-precision type, such as potentiometers, double bridges, galvanometers, permeameters, etc. A second small laboratory is for illumination tests of various kinds. This is equipped with photometers, illuminometers and several types of foot-candle meters. A third unit in this suite will be used for communication and power transmission testing, with electronic testing being developed. Its equipment includes an artificial transmission line, test oscillator, bridge, vacuum tube ammeter-voltmeter, various electronic units and auxiliary apparatus needed in this particular field of electrical

testing. This floor is completed by a medium-sized locker room and lavatory adjacent to the main electrical laboratory, and a janitors' room.

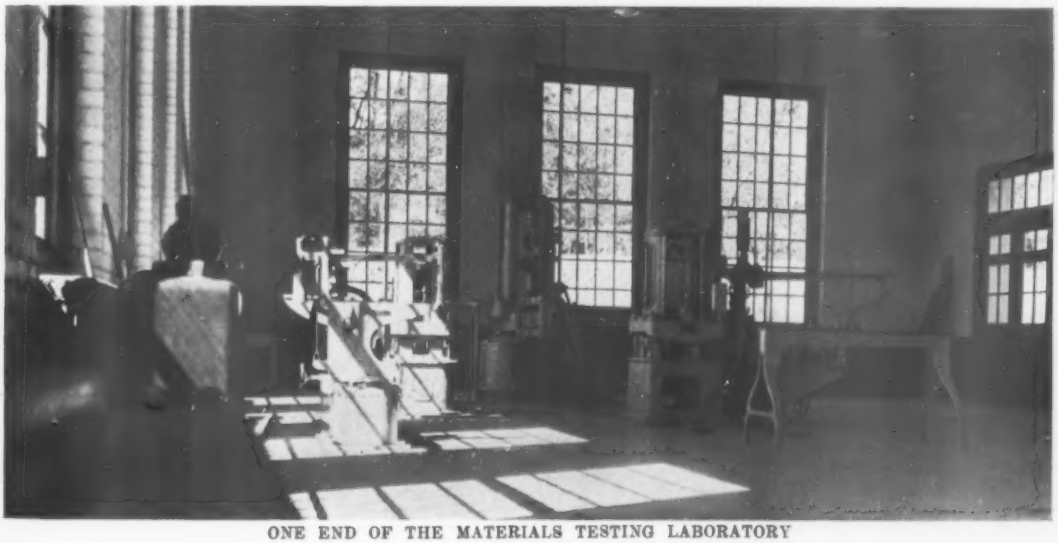
The upper story of this w...g is for mechanical engineering. A large laboratory is being developed for aeronautical testing. Here are found aeroplanes, aeroplane engines and auxiliary apparatus, and soon a wind tunnel of moderate proportions will be built and installed. An office and a storeroom adjoin this laboratory, and a locker and lavatory are placed for use on this level. A repair shop will provide facilities for repairing apparatus and for building experimental equipment. This shop communicates with the lower level by freight elevator, which will be installed later, the complete shaft only having been built. A separate tool-room adjoins the repair shop. A wood shop is equipped with the usual motor-driven wood-working machinery. A second shop provides a variety of machine tools. Instead of actual shop practice, however, it will be the policy here to use this machinery to familiarize the student with principles of machine design as well as to introduce him to both possibilities and limitations of such equipment in production. The last unit in this division will allow the student to become acquainted with various phases of metallography. The equipment here includes an electric heat-treating furnace, polishers, microscopes, hardness tester, and varied samples of metal and alloys.

It may be noted that the major technical instruction in civil, electrical and mechanical engineering is cared for in this new building group.

LIBRARY AND READING ROOM

The fourth major course, chemical engineering, has its laboratory and class instruction given in the Chemical Laboratory, where space is found for the work which could not be made available within the financial limitations surrounding the erection of this building. In addition to the technical instruction, all mathematics and English for the engineering students will be given in Thornton Hall. Physics, chemistry, modern language and certain other humanities will continue to be given in the College of Arts and Sciences.

With the facilities made available in Thornton Hall, many restrictions of space under which instruction has been carried on hitherto will be removed. The rigid disciplines of the theoretical courses which have ever been a part of the instruction here will hereafter be supplemented by the advantages of adequate space and equipment for both students and faculty.



ONE END OF THE MATERIALS TESTING LABORATORY

The Biological Science Building of the State College of Washington

BY STANLEY A. SMITH
COLLEGE ARCHITECT

FOR the past two years the State College of Washington, at Pullman, has been engaged in a $1,000,000 building program with the aid of Public Works Administration funds. The buildings constructed under this program are a Chemistry Building, a Power Plant, and a Biological Science Building. Of this group, the Biological Science Building, designed by Rigg & Vantyne, architects, of Spokane, is the largest, covering an area of 100 by 200 feet and costing $265,000 exclusive of all equipment. It is to accommodate the Zoology, Botany, and Bacteriology Departments and a large Natural History Museum.

The building is located on the southeast part of the Campus and is four stories high with a finished attic. The first story is faced with terra cotta, the second is rusticated brick, and the remaining two stories are face brick with terra cotta trim. The imposing main entrance, on the west elevation and extending through two stories, is of terra cotta trim with massive cheek blocks of solid granite surmounted with ornamental light standards. The steps also are of granite. A secondary entrance at the north, which extends through one story, is quite similar to the main entrance. On the east elevation there are two service entrances opening on the first floor.

The structural design is of reinforced concrete with beams and floor slabs poured monolithically. The interior corridor partitions are of concrete, and all others are of less permanent construction, so as to permit future rearrangement of rooms, should such be found desirable.

The walls in the building are finished with hard wall plaster on concrete or on gypsum plaster board lath. The exposed beams and ceilings are not plastered but painted to match the walls. The ceiling of the large lecture room on the second floor has acoustical treatment, and the ceilings of the fourth story and attic are covered with insulation of 2 inches thickness.

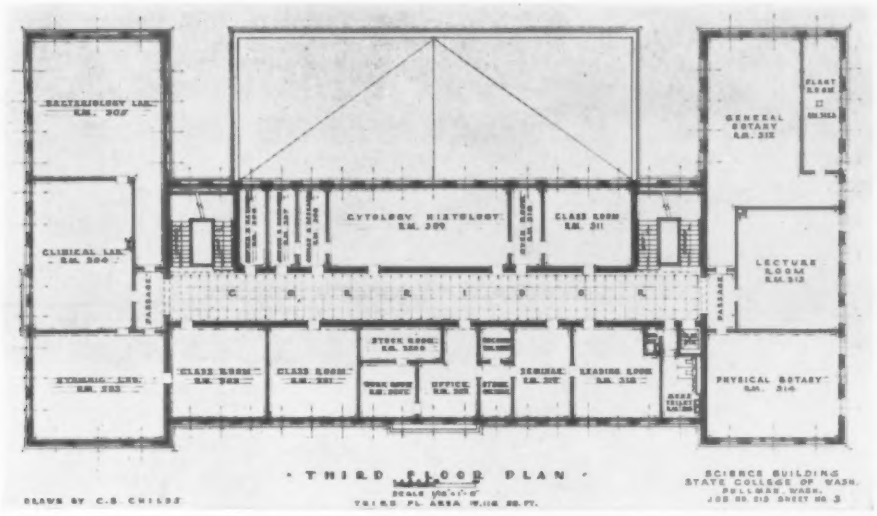
The classroom floors are finished with asphalt tile, using mahogany for the border and red and terra cotta for the field. Terrazzo, used in the corridors, museum, and toilet rooms, is of light pink and buff mottled with a green border and base.

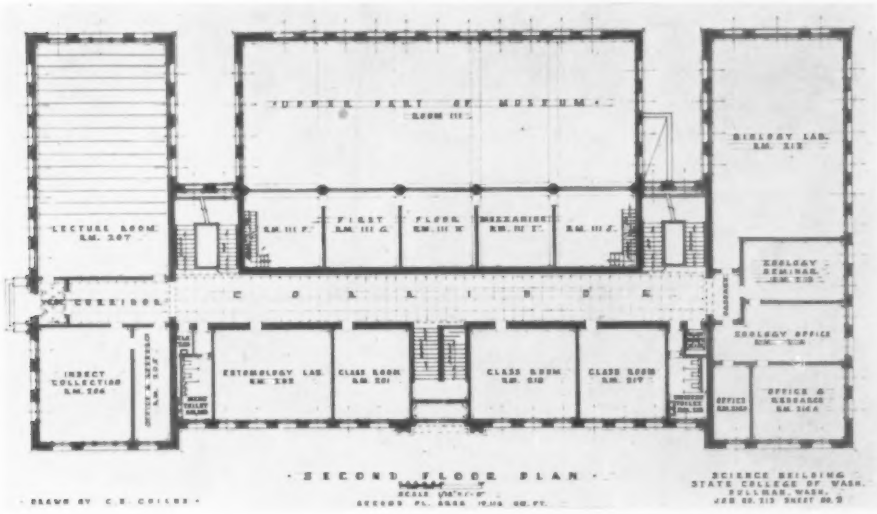
The Mechanical Equipment

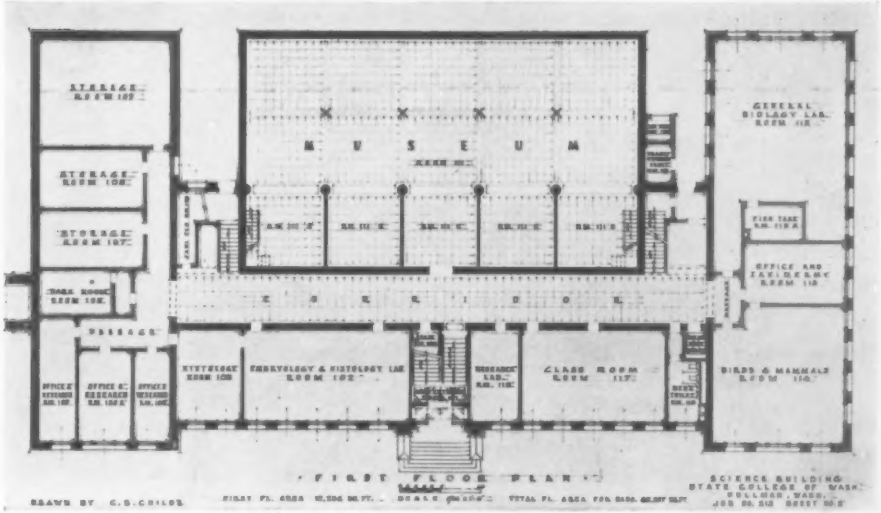
Electrical.—The various laboratories of the building are provided with current according to their needs. The general electrical system is single-phase, three-wire, 120-208 volts. The power system for the motors and X-ray equipment is three-phase, three-wire, 208 volts. The corridors are equipped with class call bells which are part of the Campus system. The three departments occupying the building have their individual buzzer systems connecting the main offices with their respective classrooms and laboratories.

Plumbing.—In addition to the general plumbing system, a very complete special laboratory system has been installed, consisting of hot and cold water, waste, vent, vacuum, distilled water, compressed air, and gas lines. The materials used in the pipe lines were selected after careful experiments as to their adaptability for the special purpose for which they were intended.

Heating.—The building is heated with a two-pipe up-feed gravity, vapor steam system, using

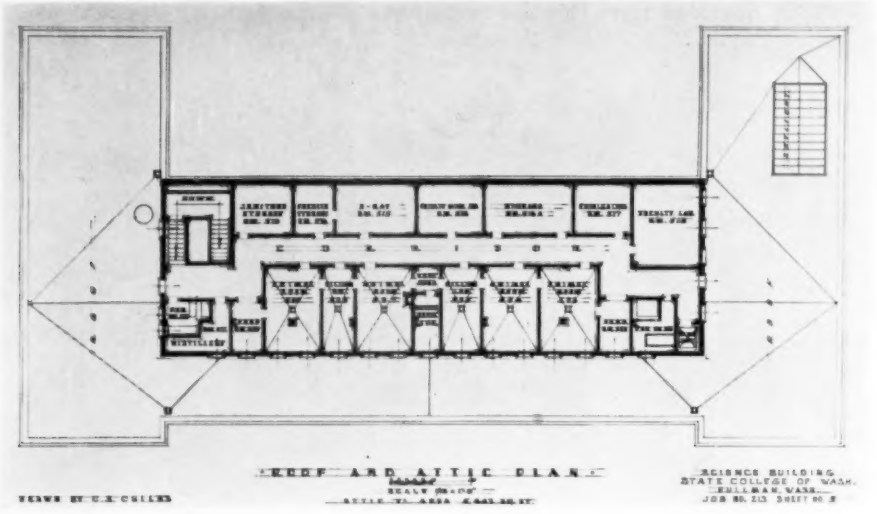

BACTERIOLOGY LAB.
CLINICAL LAB.
CYTOLOGY HISTOLOGY
CLASS ROOM
GENERAL BOTANY
LECTURE ROOM
CORRIDOR
STOCK ROOM
CLASS ROOM
CLASS ROOM
OFFICE
SEMINAR
LEADING ROOM
PHYSICAL BOTANY
THIRD FLOOR PLAN
SCIENCE BUILDING
STATE COLLEGE OF WASH.
PULLMAN, WASH.

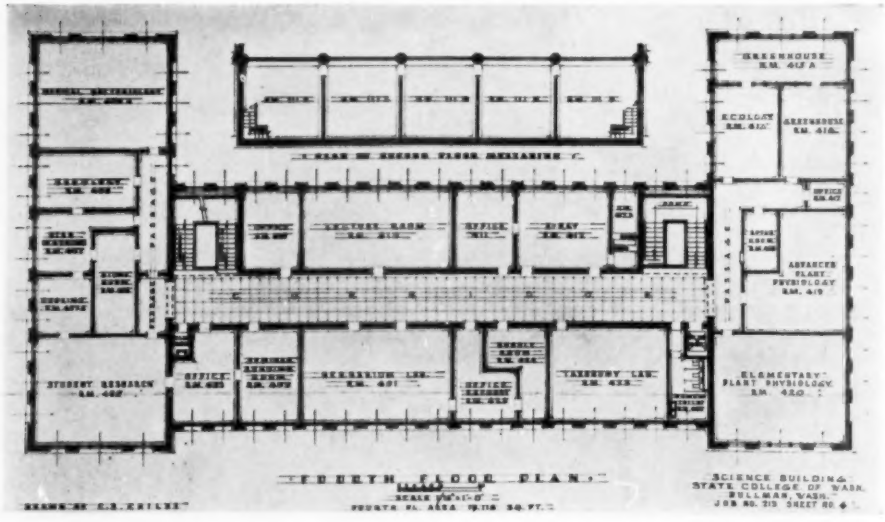

UPPER PART OF MUSEUM
LECTURE ROOM
BIOLOGY LAB.
ZOOLOGY SEMINAR
ZOOLOGY OFFICE
CORRIDOR
INSECT COLLECTION
ENTOMOLOGY LAB.
CLASS ROOM
CLASS ROOM
OFFICE & RESEARCH
SECOND FLOOR PLAN
SCIENCE BUILDING
STATE COLLEGE OF WASH.
PULLMAN, WASH.


STORAGE
STORAGE
STORAGE
DARK ROOM
PASSAGE
MUSEUM
GENERAL BIOLOGY LAB.
CORRIDOR
STORAGE
EMBRYOLOGY & HISTOLOGY LAB.
CLASS ROOM
BIRDS & MAMMALS
OFFICE AND LABORATORY
FISH TANK
FIRST FLOOR PLAN
SCIENCE BUILDING
STATE COLLEGE OF WASH.
PULLMAN, WASH.

cast-iron direct radiation, except in the large lecture room, which is heated and ventilated by means of unit ventilators, and in the Museum, which is heated by means of warm air drawn by a fan through sheet-metal ducts from the heating tunnel. The main lines, both feed and return, run in the basement under the first floor. This basement pipe space under the first floor is excavated throughout the entire building to a depth of 4 feet 6 inches below the top of the first floor slab, with the exception of the space under the Museum, which is not excavated. The steam is fed into the building from the central station system of the College Campus.

Ventilating.—All rooms, except the main lecture room and the Museum, are ventilated by means of an exhaust system. The air from all rooms except the Museum is carried to the fourth floor ceiling level by concrete ducts built into the walls along the corridors. The exhaust air from the Museum is carried through sheet-metal ducts in the inside walls of the Museum up to the level of the first floor corridor ceiling, where it is exhausted into the corridors. The animal and killing rooms in the attic have the air exhausted through separate exhaust fans located on the roof.





In the main lecture room unit ventilators are installed, which include copper radiators, fans, motors, dampers, and thermostatic controls.

Elevator.—An automatic electric elevator is installed in the building for use of faculty members and for freight. It is not open to the students.

The Museum

The large Natural History Museum, extending through the first and second floors, is

one of the most outstanding points of interest in the building. Along the west side, supported by massive columns and girders, are two mezzanine floors on which are located numerous display cases for small exhibits. These mezzanine floors are subdivided by stud partitions, so that the various exhibits may be segregated.

The windows are placed close to the ceiling, to make available more wall space for the exhibits. In order to minimize the harmful effects of light, these windows are glazed with a type of glass which eliminates the infra-red rays that seem to be most active in causing discoloration of exhibit specimens. This necessitated an extensive artificial lighting system.

There are two fish aquariums in the middle of the room near each end. These are glass-enclosed and rise from 4 to 6 feet above the floor. With the exception of the exhibits in these aquariums, all the exhibits consist of mounted specimens.

The Zoology Department

The Zoology Department occupies the first two floors, with three large laboratory rooms, four combined office and research laboratories, one large classroom, and a small research laboratory on the first floor. An interesting feature of the biology laboratory is the group of fish tanks, with an overhead trolley used to move the tanks around the room. On the second floor are three classrooms, the large lecture room, biology laboratory, entomology laboratory, main zoology offices, seminar, and a reference room for insect collections.

The Bacteriology Department

The Departments of Bacteriology and Botany jointly occupy the third and fourth floors, bacteriology having the north portion and botany the south. The Bacteriology Department has its general, clinical, hygienic, and cytology-histology laboratories, three combined office and research laboratories, and two classrooms on the third floor. The medical bacteriology, serology, and student research laboratories are on the fourth floor, also the dish-washing, cooking, seminar, and x-ray rooms and the storerooms.

The Botany Department

The Botany Department has its main office, seminar, reading room, general laboratory and physical botany laboratory interpolated with a lecture room and a classroom on the third floor. The herbarium, taxonomy, advanced plant physiology, and ecology laboratories, apparatus room, lecture room, four offices, and two greenhouses are occupied by this department on the fourth floor. Special provision was made for drying and mounting all botanical specimens. The Botany Department has one of the most complete botanical collections of Pacific Coast plants in existence. The two greenhouses in this building are for the temporary caring of botanical specimens for student and research use. The growing of these botanical specimens is in a unit of the College greenhouses, conveniently located near the Biological Science Building.

The Attic

The attic rooms in the center section of the building are used as animal rooms, killing rooms, and an X-ray room for both the Bacteriology and the Zoology Departments. It was found advisable to place the animals in this location in order to eliminate as much as possible the objectionable features of animal rooms. There are also Faculty laboratories and research rooms on this floor, both lighted and darkened. The fumigating room, which is heated to a high temperature by means of extra radiation and made air-tight for possible gas fumigation, is used for the fumigating of botanical specimens which may be infected with injurious insects. The ventilating fans are also on this floor.

This building was planned with the idea of future development in the departments, and to provide the best possible room arrangement according to each department's needs. The most modern mechanical equipment has been installed, which will aid in the extensive experimental work connected with the biological sciences.

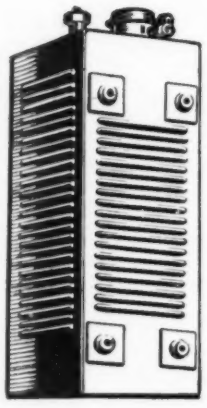
EDISON STORAGE BATTERY DIVISION

Thomas A. Edison, Incorporated

West Orange, New Jersey

EDISON STORAGE BATTERIES FOR SCHOOLS AND COLLEGES

For the School Plant

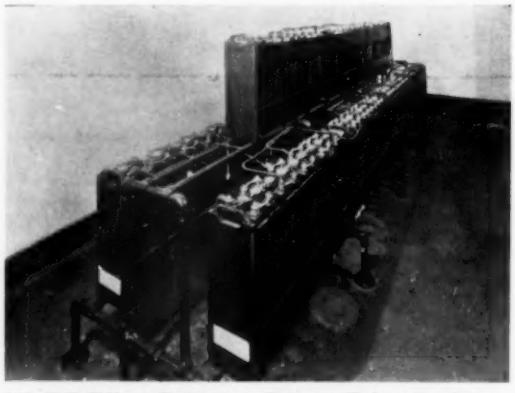


The vast improvements in plant made in educational institutions in recent years have resulted in the almost universal use of the following electrical services:

Telephone system
Fire drill and alarm system
Time clock system
Program bell and gong system
D.C. laboratory supply circuits
Emergency lighting system

Existing circuits in many schools are complex — because services were installed one after another as separate units. All these electrical circuits can be simplified and tied together, using the same source of power as supplies the building with light. In addition, many state legislatures have properly required that an entirely independent power source be provided, to automatically take over essential circuits when the regular current supply fails.

An unfailing power source for this purpose is a dependable storage battery, kept continually charged by rectified central station power. The **Edison nickel - iron - alkaline storage battery**— because of its dependability, long-time economy, trouble - free characteristics and unique features of construction — is the choice of those seeking the most reliable power supply for school electrical uses.



100 Cell Edison Battery at Rutgers University Science Building basement installed seven years ago

For the School or College Laboratory

Storage batteries are used in school and college laboratories both as an aid in instruction concerning such batteries and as a source of direct current for students' experiments or for instructors' lecture demonstrations.

Inasmuch as storage batteries have wide application in various motive power services and lighting requirements, the need for instructing students on the construction, care and operation of such batteries is apparent.

The extensive commercial use of the **Edison nickel - iron - alkaline storage battery** and the fact that the student is likely to be concerned with this type of battery after graduation, make instruction concerning the **Edison battery** especially pertinent.

Its unique principle of operation, its rugged construction, its trouble-free characteristics and its noteworthy over-all economy, have made the **Edison battery** for many years the choice of the leading school and industrial laboratories in America.

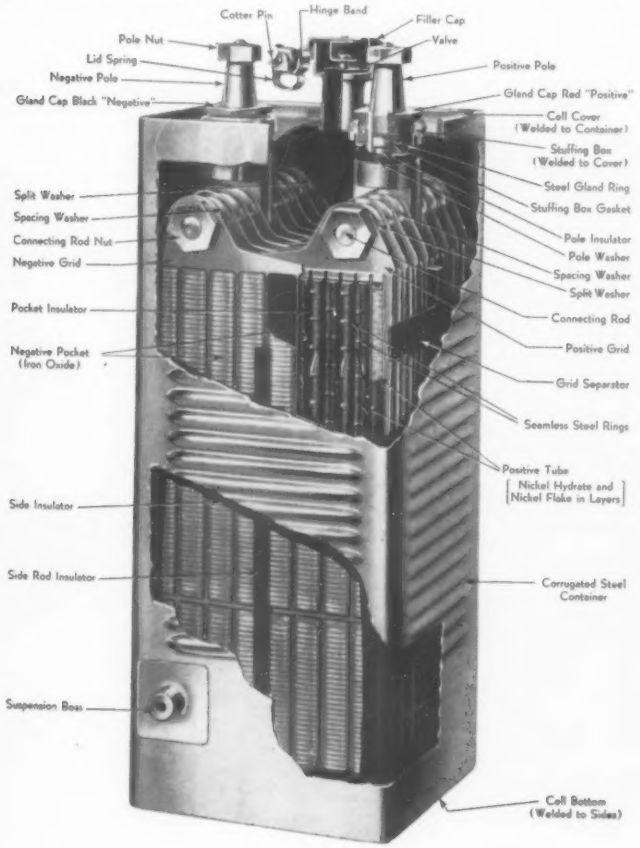
The following pages give a brief description of the **Edison battery** and its outstanding advantages, a list of the sizes ordinarily employed to meet the various school requirements, and a very brief discussion of the special adaptability and dependability of this type of battery as a source of d.c. for laboratory supply circuits.

Built Like a Watch — Rugged as a Battleship

The Edison nickel-iron-alkaline storage battery is unlike other batteries in principle, design and construction.

Its principle of operation during a cycle of charge and discharge consists mainly of a transfer of oxygen back and forth between its positive and negative elements, whose general construction may be seen in the illustration of the cut-away cell (below).

This electro-chemical action is unique in that it is completely reversible. With continued use, there is no loss in the quantity of active material in the plates. The electrolyte is an aqueous solution of potassium and lithium hydroxide and does not at any stage cause a disintegration or solution of the active materials.



Potassium hydroxide is a recognized preservative of steel, and to this fact is due the advantage of steel construction. As shown in the illustration, containers, grids, pole pieces—even the pockets and tubes enclosing the active materials—are of steel construction throughout. This results in great strength and durability combined with light weight.

The Edison storage battery gives a life up to twenty years in school services—often more (several times longer life than other batteries); therefore the cost per year of service is unusually low.

Outstanding Advantages of the Edison Storage Battery

1. Its life is so long that the annual depreciation figure is lower than that for any other type of storage battery.
2. Its nickeled steel container is unbreakable.
3. The Edison battery, unlike all other types, is easy to lay up. Merely discharge it to zero voltage and short circuit. It may be left standing idle in this condition indefinitely without injury.
4. It may be short-circuited without injury.
5. Unlike all other batteries, an accidental charge in the reverse direction will not injure an Edison battery.
6. It is entirely free from ordinary storage battery diseases.
7. Freedom from corrosive acid fumes permits its use in close proximity to delicate apparatus.
8. It is not damaged by freezing.
9. Its electrolyte is a preservative of steel.

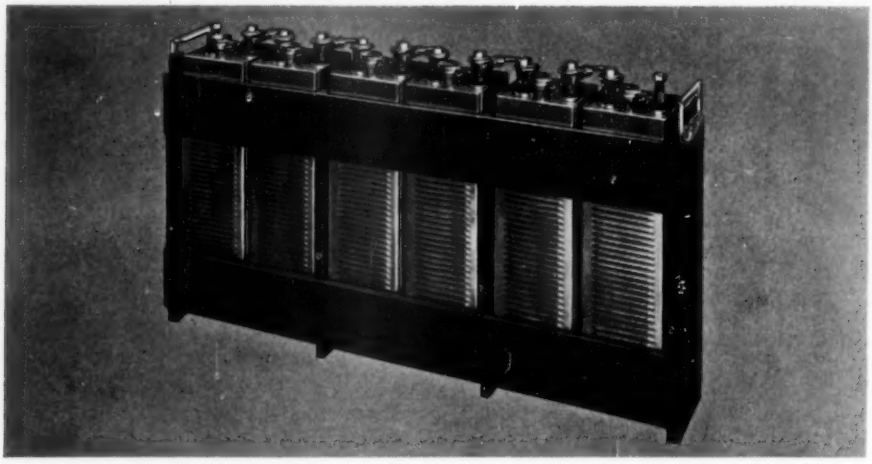


Illustration showing a typical method of assembling and connecting a group of six Edison cells

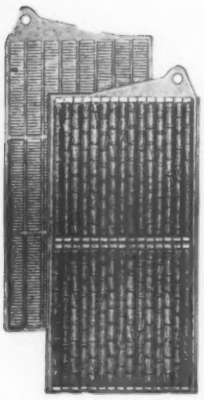
10. It increases in capacity during the first several years of service.
11. It requires no internal cleaning; the active materials being held securely in perforated nickeled steel tubes and pockets.
12. Its cells are hermetically sealed except for the single filler opening, indicating conclusively that no plate renewals or other repairs are needed or expected.
13. Its tray assemby and cell connections are extremely simple.
14. It requires no spare parts.
15. It does not require weekly equalizing charges.
16. It requires NO renewals of separators throughout its long life.
17. It is light in weight.

Edison Nickel - Iron - Alkaline Storage Batteries are available in various capacities from 11.25 to 675 ampere hours for use in light, medium, and heavy duty work. In the tabulation below are listed those sizes which are ordinarily employed to meet the various requirements of school and commercial laboratory work. Information regarding larger sizes will be furnished on request. E.M.F. averages 1.2 volts per cell for all sizes and types.

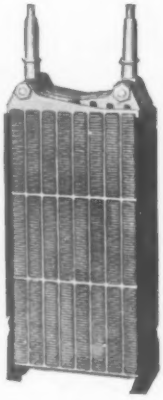
Edison Cell Type	List Price per Cell, F.O.B. Orange, N. J.	Ampere Hours	Amperes for 5 Hrs.	Length * 1 Cell Tray	Length* 5 Cell Tray	Width All Trays	Height All Trays	Approx. Weight per Cell
N2	$ 5.25	11.25	2.25	$2^{15}/_{16}$"	$10^{1}/_{16}$"	$3^{1}/_{2}$"	$8^{7}/_{16}$"	2.0 lbs.
B1	6.00	18.75	3.75	$3^{1}/_{16}$"	$10^{23}/_{32}$"	$6^{1}/_{8}$"	$10^{13}/_{16}$"	5.3 lbs.
B1H** ..	6.50	18.75	3.75	$3^{1}/_{16}$"	$10^{23}/_{32}$"	$6^{1}/_{8}$"	$12^{9}/_{16}$"	6.7 lbs.
B2	8.50	37.50	7.50	$3^{1}/_{16}$"	$10^{23}/_{32}$"	$6^{1}/_{8}$"	$10^{13}/_{16}$"	6.0 lbs.
B2H** ..	9.00	37.50	7.50	$3^{1}/_{16}$"	$10^{23}/_{32}$"	$6^{1}/_{8}$"	$12^{9}/_{16}$"	7.2 lbs.
B4	11.75	75.00	15.00	$4^{1}/_{4}$"	$16^{21}/_{32}$"	$6^{1}/_{8}$"	$10^{13}/_{16}$"	9.5 lbs.
B4H** ...	12.25	75.00	15.00	$4^{1}/_{4}$"	$16^{21}/_{32}$"	$6^{1}/_{8}$"	$12^{9}/_{16}$"	10.9 lbs.
B6	16.00	112.50	22.50	$5^{3}/_{8}$"	$22^{9}/_{32}$"	$6^{1}/_{8}$"	$11^{1}/_{32}$"	13.0 lbs.
B6H** ..	16.50	112.50	22.50	$5^{3}/_{8}$"	$22^{9}/_{32}$"	$6^{1}/_{8}$"	$12^{27}/_{32}$"	15.2 lbs.
A4	20.00	150.00	30.00	$4^{17}/_{32}$"	$17^{5}/_{32}$"	$6^{1}/_{8}$"	$15^{29}/_{32}$"	16.5 lbs.
A4H	20.50	150.00	30.00	$4^{17}/_{32}$"	$17^{5}/_{32}$"	$6^{1}/_{8}$"	$18^{19}/_{32}$"	19.3 lbs.
A6	27.50	225.00	45.00	$5^{23}/_{32}$"	$23^{3}/_{32}$"	$6^{1}/_{8}$"	$15^{31}/_{32}$"	22.4 lbs.
A6H	28.00	225.00	45.00	$5^{23}/_{32}$"	$23^{3}/_{32}$"	$6^{1}/_{8}$"	$19^{3}/_{32}$"	25.5 lbs.

*** Available in any number of cells per tray up to 16 cells (30 1/4" long) for N2 type; up to 12 cells (24 3/8" long) for B1, B1H, B2, and B2H types; up to 12 cells (39" long) for B4 and B4H types; up to 10 cells (44 1/8" long) for B6 and B6H types; up to 12 cells (39 3/8" long) for A4 and A4H types; and up to 10 cells (45 3/16" long) for A6 and A6H types.**

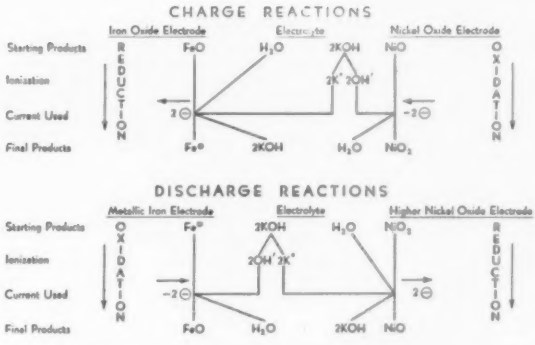
**** The letter "H" denotes high type cells; these cells have the same characteristics as standard cells but are built higher so as to hold more electrolyte and are used in installations where extremely infrequent flushing periods are desirable.**



Positive tubes, in front, and negative pockets, in the rear, are clamped to their respective plates under great pressure



Assembled elements of Type A4 cell removed from container



The chemistry of the Edison Nickel-Iron-Alkaline Cell helps explain its freedom from electrochemical deterioration, its dependability and its long life

For D.C. Laboratory Supply Circuits

The Edison nickel-iron-alkaline storage battery as a source of d.c. for laboratory supply circuits affords a dependability no other type of battery can equal. Use of steel for all structural parts combined with an alkaline electrolyte (a recognized preservative of steel), makes it practically indestructible and permits secure retention of all active materials within the plates.

An outstanding advantage of the **Edison battery** for school use is the fact that it cannot be injured by overcharge, overdischarge, charge in reverse or other so-called electrical accidents. Another advantage is the ability of the **Edison battery** to stand discharged during all vacation periods without need of attention, and without deterioration.

In the more important applications, such as mine locomotives and electric industrial trucks, more Edison Batteries are in daily use than all other kinds of batteries combined. In multiple unit car control, where the very lives of passengers are dependent upon the unfailing operation of a storage battery, Edison Batteries comprise nearly nine out of every ten storage batteries in use. Other services include railway train car lighting and air conditioning, railway signaling, marine uses for radio lighting and operation of auxiliary equipment, time clock service, airway beacons. These widespread uses make instruction in the care, operation and construction of **Edison batteries** a matter of real value to the student. **The Edison Storage Battery Division, West Orange, New Jersey, will gladly supply further information to any interested school or college executives.** 30-page pamphlet, "Edison and His Storage Battery," by W. H. Meadowcroft, which includes chronology of notable events and achievements in the life of Thomas Alva Edison is also available upon request.

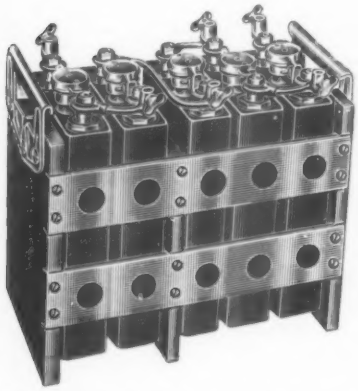


Figure 5.—Assembly of 5 B2H cells in standard tray

Figure 6.—All laboratory assemblies are supplied with tap-off connectors at no extra cost. This permits use of any number of cells as desired

Figure 7.—Assembly of 2 BIH cells in standard tray

PHILCO-BATTERY DIVISION

Tioga and C Streets, Philadelphia, Pa.

Boston · New York · Cleveland · Pittsburgh · Atlanta · Chicago · St. Louis · Kansas City · San Francisco · Los Angeles · Portland · Seattle

FOR over thirty years, Philco Batteries have been used by leading schools and colleges throughout the United States in such applications as:

Emergency Lighting
Control and Auxiliary Power
Fire Alarm Service
Interior Telephone Systems
Program Bells and Gongs
Laboratories
Time-Clocks
Etc.

Now Philco announces FLOTÉ—a battery specially designed for maximum capacity and long-life, in both full-float and cycle service, for laboratory and auxiliary power applications.

Further details will be found on the opposite page, and any engineering information not shown will gladly be furnished by Philco Battery Research and Engineering Laboratories. Estimates will be handled promptly at all Philco offices, as listed at the top of this page.

PERFECT MECHANICAL ASSEMBLY

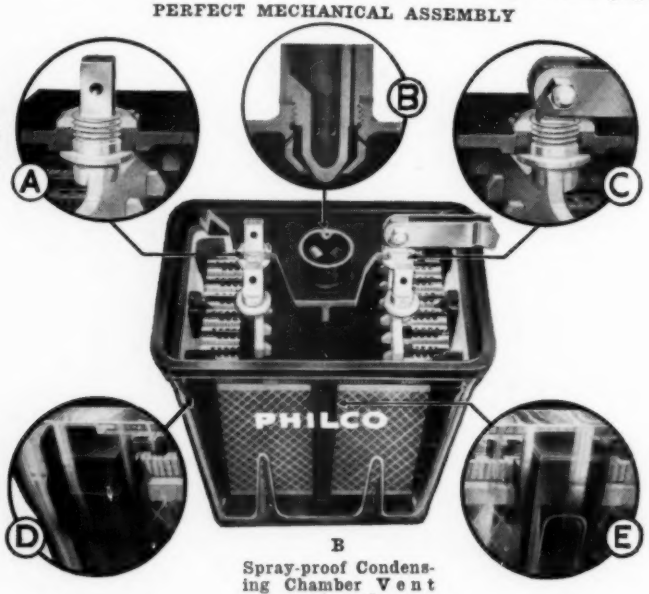
A
Bolted Negative Post . . . note the permanent rubber-lokt post seal

B
Spray-proof Condensing Chamber Vent . . . condensed spray redrains into cell. (Patented)

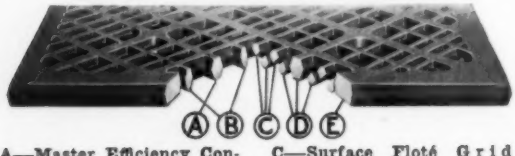
C
Bolted Positive Post and Double Copper Lead Coated Connectors

D
Corner Lock . . . tapered hard rubber locking the element in monobloc form. (Patented)

E
Side Lock . . . used in FF types to superbrace the center of the wide plate area. (Patented)



END VIEW OF POSITIVE GRID SHOWING CROSS-SECTION OF FLOTÉ CONSTRUCTION



A—Master Efficiency Conductor "A" (notice the taper giving more surface for increased conductivity and permitting a maximum percentage of the grid metal beneath the surface of the plate).

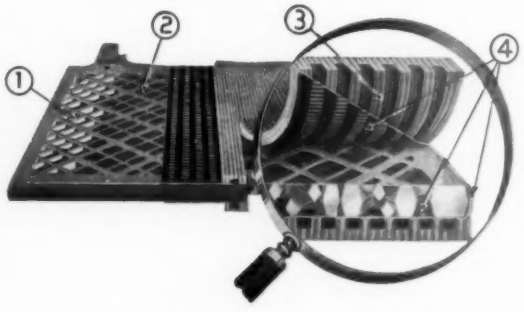
B—Master Efficiency Conductor "B" — rugged thru-member running in lug direction. An equalizer on both charge and discharge which in addition affords superior locking of power producing material.

C—Surface Floté Grid Members "C"—running only from left to right furnish perfect grid balance and add to the overall high electrical efficiency.

D — Triple Diagonal Capacitators—the close combination of two members and one heavy thru-member in left to right direction adds a feature of improved conductivity found only in Floté.

E — Exceptional Grid Frame which surrounds the internal Floté construction.

COMPOSITIVE VIEW OF FLOTÉ POSITIVE GRID, PLATE, RETAINER AND SEPARATOR



1—Floté Positive Grid Section.
2—"K" Processed Plate Area.
3—Quarter-sawed Douglas Fir Separator.
4—Floté Type Slotted Rubber Retainer.

Type	Capacity at the 8 hour rate to 1.75 V.	Overall Dimensions			Weight Packed
		Length	Width	Height	
FLOTÉ IN STEEL-GLASS					
3 DF	24	4 15/16	8 15/16	13 1/4	35
5 DF	48	5 13/16	8 15/16	13 1/4	43
7 DF	72	6 11/16	8 15/16	13 1/4	51
9 DF	96	7 9/16	8 15/16	13 1/4	60
5 EF	96	6 1/8	11 3/8	15 3/4	71
7 EF	144	7	11 3/8	15 3/4	84
9 EF	192	7 7/8	11 3/8	15 3/4	98
11 EF	240	8 3/4	11 3/8	15 3/4	111
13 EF	288	9 5/8	11 3/8	15 3/4	128
7 FF	288	7 3/8	14 1/2	19 1/4	127
9 FF	384	8 1/4	14 1/2	19 1/4	149
11 FF	480	9 1/8	14 1/2	19 1/4	170
13 FF	576	10	14 1/2	19 1/4	190
15 FF	672	10 7/8	14 1/2	19 1/4	212
17 FF	768	12 5/8	14 1/2	19 1/4	265
23 FF	1056	15 1/4	14 1/2	19 1/4	332
FLOTÉ — MULTI-UNIT TYPES					
76 RH	50	8 1/8	7 1/2	10 7/16	53
74 RH	50	8 1/8	7 1/2	10 7/16	48
72 RH	50	8 1/8	7 1/2	10 7/16	43
136 RH	100	13 13/16	7 11/16	10 7/16	97
134 RH	100	13 13/16	7 11/16	10 7/16	87
132 RH	100	13 13/16	7 11/16	10 7/16	77
116 KF	100	13 13/16	7 11/16	10 7/16	97
114 KF	100	13 13/16	7 11/16	10 7/16	87
112 KF	100	13 13/16	7 11/16	10 7/16	77
52 CF	10	2 5/8	3 5/8	7 3/4	8
92 PF	20	4 5/8	3 5/8	7 3/4	13
54 CF	10	2 13/16	7 1/4	7 3/4	12
94 PF	20	4 5/8	10 7/16	7 3/4	29
96 PF	20	4 5/8	10 7/16	7 3/4	25

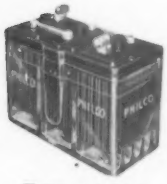
Type	Capacity at the 8 hour rate to 1.75 V.	Overall Dimensions			Weight Packed
		Length	Width	Height	
FLOTÉ — SUSPENDED TYPES					
3 DFS	25	4 1/2	8 5/16	12 7/16	28
5 DFS	50	4 1/2	8 5/16	12 7/16	34
7 DFS	75	6 3/4	8 5/16	12 7/16	47
9 DFS	100	6 3/4	8 5/16	12 7/16	52
5 EFS	100	7 1/8	10 1/8	16 3/16	72
7 EFS	150	7 1/8	10 1/8	16 3/16	79
9 EFS	200	7 1/8	10 1/8	16 3/16	86
11 EFS	250	10 5/16	10 1/8	16 3/16	120
13 EFS	300	10 5/16	10 1/8	16 3/16	127
15 EFS	350	10 5/16	10 1/8	16 3/16	134
17 EFS	400	12 9/16	10 1/8	16 3/16	159
19 EFS	450	12 9/16	10 1/8	16 3/16	165
21 EFS	500	12 9/16	10 1/8	16 3/16	172
DIAMOND-GRID — SUSPENDED TYPES					
5 KO	38	4 1/2	8 5/16	12 7/16	30
7 KO	57	4 1/2	8 5/16	12 7/16	34
9 KO	76	6 3/4	8 5/16	12 7/16	45
11 KO	95	6 3/4	8 5/16	12 7/16	48
13 KO	114	6 3/4	8 5/16	12 7/16	52
5 EO	90	7 1/8	10 1/8	16 3/16	62
7 EO	132	7 1/8	10 1/8	16 3/16	68
9 EO	174	7 1/8	10 1/8	16 3/16	74
11 EO	210	7 1/8	10 1/8	16 3/16	79
13 EO	243	7 1/8	10 1/8	16 3/16	86
15 EO	280	10 5/16	10 1/8	16 3/16	120
17 EO	320	10 5/16	10 1/8	16 3/16	124
19 EO	360	10 5/16	10 1/8	16 3/16	131
21 EO	400	10 5/16	10 1/8	16 3/16	137
23 EO	440	12 9/16	10 1/8	16 3/16	161
25 EO	480	12 9/16	10 1/8	16 3/16	167
27 EO	520	12 9/16	10 1/8	16 3/16	173

Modern Spray-Proof Laboratory Installation of Philco Floté in Steel-Glass Batteries

Type 52-CF

FLOTÉ TYPE CF (*Capacity 10*)

This type of battery is available in single and double cell units (52-CF and 54-CF) and together with Type PF, which is of similar construction but possesses nine instead of five plates per cell, is widely used for telephone, time-clock, signal control, fire alarm and laboratory applications. It includes all of the improved Philco features, and the single cell units of both types are especially popular for fire alarm service, the jars being grooved to fit any standard fire alarm rack.



Type 116-KF

FLOTÉ TYPE KF (*Capacity 100*)

This battery, available in three sizes, has been found ideal for PBX (private branch exchange) supervisory control, signal and emergency lighting service, and is the most rugged long-life battery of its type ever developed. It includes every Philco improvement, and its extra-thick, high-type plates insure unequalled service with minimum maintenance. Its unusual abuse factor takes account of the modern trend toward automatic, completely unattended telephone exchanges.

FLOTÉ TYPE FF (*Capacity 288 to 1056*)

Type 23-FF

This is the largest individual cell group in the Floté Steel-Glass line of Philco batteries, which combines the advantages of the rugged rubber-jar cell, as used in severe electric truck and locomotive service with the requirements for glass jar visibility in power applications. The superior points of this assembly will be appreciated after studying the illustrations on the opposite page. It represents the last word in mechanical and electrical perfection for all power applications.

FLOTÉ TYPE EFS (*Capacity 100 to 500*)

Type 17-EFS

This is one of the Floté suspended element line of batteries described in the right-hand section of the battery data tabulated above, and recommended where initial cost is all-important. It includes a jar of the finest blown-glass, extra-heavy cover, spray-proof funnel vent, built-in charge indicators, heavy copper lead-plated all bolted connectors and sturdy, double tie-rods. It is designed for general power applications.

120 Volt Philco Emergency Lighting Battery on Modern, All-Steel, Step-Type Rack

ALBERENE STONE CORPORATION OF VIRGINIA

Quarriers and Fabricators of Alberene Soapstone Virginia Alberene Stone and Virginia Black Serpentine

419 Fourth Avenue, New York, N. Y.

Quarries and Mills at Schuyler, Va.

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ALBERENE SOAPSTONE

Natural quarried stone of medium hardness, produced and fabricated for more than 40 years; used in increasing quantities for:

Table Tops and Backs
Reagent Shelving
Fume Hoods, Gutters
Sinks, Drainboards
Tanks and Tank Linings
Toilet Partitions
Shower Compartments
Interior and Exterior Trim
Door and Window Sills
Fireplace Linings, Hearths
Spandrels

VIRGINIA ALBERENE STONE

Selected stone of extreme hardness, reserved exclusively for Stair Treads, Landings, Platforms, and Flooring. Abrasive tests show the highest durability factor on the U. S. Bureau of Standards scale of any natural stone commercially used for these purposes. Its siliceous nature makes it non-slip wet or dry.

VIRGINIA BLACK SERPENTINE

This natural stone is becoming extremely popular. Its great resistance to weather action makes it desirable for exterior as well as interior work. When sand-blasted (as in spandrels) the fine tracery of the designs stands out against the polished black surface.

PHYSICAL AND CHEMICAL PROPERTIES

All Alberene stone is homogeneous and finely granular in all directions, blue-gray in color, dense and non-stratified, chemically resistant, impervious and non-staining. Alberene soapstone is easily machined—bored, slotted, grooved, tongued, turned—without splitting or spalling.

METHOD OF CONSTRUCTION

Alberene laboratory fixtures are practically one piece structures of solid stone. Table top slabs are united by a practically invisible joint employing a strip of non-corrosive metal cemented in grooves, with abutting slab edges sealed with acid-proof cement. Fume hoods, sinks and tanks are assembled with tongue-and-groove joints held by hidden bolts and nuts and cemented —permanently gas and liquid tight.

SERVICE IN DESIGN AND INSTALLATION

Every laboratory of major importance equipped in the past 40 years has used Alberene soapstone wholly or in large part. Out of this experience the company offers an advisory service, freely available to school and university authorities and architects.

MANUFACTURING FACILITIES

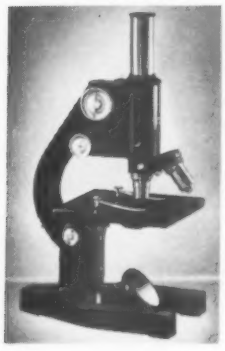
Quarries and mills at Schuyler, Virginia, are the largest in the world devoted exclusively to the production and fabrication of special purpose stone.

BAUSCH & LOMB OPTICAL COMPANY

655 St. Paul Street, Rochester, N. Y.

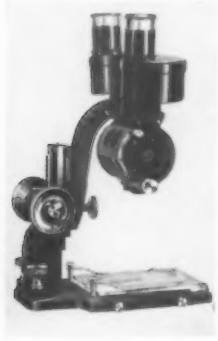
New York Chicago Boston Los Angeles San Francisco
London, England Frankfurt A/M, Germany

HH MICROSCOPE



Identical in proportions with the B & L Laboratory Microscope, the HH Microscope trains the student in use of professional instruments. Equipment is standard, including eyepieces and objectives. Large stage, rack and pinion, coarse and fine adjustment and accommodations for 1.20 N.A. Abbe Condenser.

KW TYPE MICROSCOPE



KW Wide Field Microscopes have these advantages: Stereoscopic vision enabling a three dimensional view. Five interchangeable and parfocal objectives (7X to 150X). Long working distance for dissection. Image is neither inverted nor reversed. An extremely wide field.

UNIVERSAL MICROSCOPE LAMP

The B & L Universal Microscope Lamp is an economical, convenient illuminator that has universal application in any school laboratory where microscopes are used.

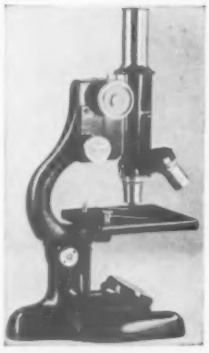
B & L MICROTOMES

The B & L complete line of microtomes makes available a microtome for every sectioning purpose. Literature is available on request.

OTHER BAUSCH & LOMB INSTRUMENTS

The instruments listed herewith are but a small part of the complete line of B & L products. If you have need for information on any optical products whatsoever, Bausch & Lomb will be glad to be of service to you.

FB MICROSCOPE



Maintains unquestionably its precision in the hands of inexperienced students. Optically and mechanically it meets all classroom requirements. Features: Standard size, coarse and fine adjustments, double revolving nosepiece, standard objectives and eyepieces, and disc diaphragm are some of the features of this classroom microscope.

Bausch & Lomb Microscope F: Equipment is standard, including a divisible objective. Fine adjustment has been emilinated in the interests of economy. Magnification from 20 to 300 diameters.

BIFOCUS OBJECTIVE

The Bifocus Objective makes a convenient addition for the microscope. By simply turning the lever you can convert the objective power from 10X to 4X for low magnification purposes. It was designed especially for use on the new "F" Microscope to make it easy for elementary students to change objective powers.

QR MAGNIFIER

This is an adjustable tripod type magnifier which is placed directly over the specimen. Has double lens, magnifying 7.5X. The threaded mount provides for accurately focusing the lens. Useful for the school laboratory in examining biological or botanical specimens or any small objects.

MICROSCOPE TABLE LAMP

This Table Lamp can be used to illuminate several microscopes at once. It is invaluable in class room work where groups of students are making observations at the same time.

ABBÉ ENGINEERING CO.—BEACH-RUSS CO.

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Boston Baltimore Buffalo Chicago Cleveland Pittsburgh Akron Detroit Los Angeles

MIXERS, MILLS, GRINDERS, SIFTERS AND CUTTERS, ROTARY VACUUM PUMPS, ROTARY AIR COMPRESSORS, ROTARY LIQUID PUMPS

For use in School and Industrial Laboratories.

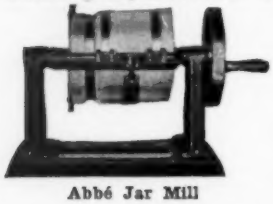
THE ABBÉ LENART MIXER

The Abbé Lenart Mixer is widely used for mixing liquids or pastes, emulsifying and dissolving. Produces rapid intensive mixing. The model

Abbé Lenart Mixer

shown is a portable unit for laboratory testing. Capacity, 1 quart. Made in all metals with or without jackets for heating or cooling. Has variable speed V-belt drive from vertical motor. Can be operated under vacuum for re-airing, while mixing. Sizes up to 2000 gallon capacity.

ABBÉ JAR, PEBBLE AND BALL MILLS

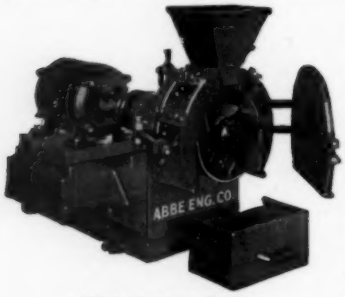


Abbé Jar Mill

For grinding and mixing, either dry or wet. All Abbé mills are manufactured in many sizes and styles for various capacities and conditions, and are arranged for either pulley or direct motor drive. Jars can be supplied in porcelain, steel, rubber, pyrex and special metals. Either flint pebbles, porcelain, or metal balls are furnished with each jar.

LABORATORY ROTARY CUTTER WITH DIRECT MOTOR DRIVE

The Abbé Laboratory Cutter, below, is used for cutting roots, herbs, barks, paper, rags, etc. Supplied with various size screens to regulate fineness of finished product. Readily opened for cleaning and changing of screens. Self-contained and supplied with hopper and drawer for finished product. Capacity 30 to 50 lbs. per hour. Also made in larger sizes.



Abbé Rotary Cutter

Write for
Bulletin No. 40—Mills, Mixers and Sifters

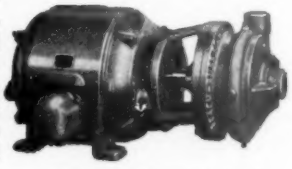
ROTARY VACUUM PUMPS AND COMPRESSORS

Beach - Russ single stage pumps are used for all vacuum and pressure requirements in Chemistry Laboratories and Industrial plants. Produces vacuum to within 1 mm. or pressures up to 35 lbs. Built in sizes from 6 to 400 cubic feet per minute. Can be supplied with complete automatic control. Also made in corrosion resisting metals. Compound units for vacuum to 5 microns.

Rotary Vacuum Pump
(Noiseless)

ACID RESISTING CENTRIFUGAL PUMPS

Cast solid of corrosion metals suitable for dilute and concentrated solutions of acids or corrosive liquids. Sizes up to 300 g.p.m. Also Rotary Liquid and Gear Pumps.



Acid Centrifugal Pump

LABORATORY VACUUM OR PRESSURE UNIT

Direct connected unit for vacuum or pressure especially designed for general laboratory use. Vacuum within 3 mm. of barometer or pressure to 15 lbs. Operates from lighting circuit. Air cooled as shown for intermittent service, water cooled for continuous service.

Laboratory Vacuum Pump
(Quiet in Operation)

Write for
Bulletin No. 46—Rotary Pumps

R. P. CARGILLE

PRODUCTS FOR SCIENTIFIC LABORATORIES

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Packets of chemicals and complete sets that provide each student with solid chemicals required for the course.

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(Bennett Balance)

A new, low-priced balance, sensitive to a few milligrams, designed for general chemistry students. Can be issued to each small group of students or, preferably, to each student so that general chemistry experiments can be performed on a quantitative basis with no crowding, confusion or delay.

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Fifty qualitatively different alloys prepared especially for use in qualitative analysis classes. Alloys make excellent unknowns. This assortment includes both simple and complex samples. Available in five gram lots, your selection, at $1.50 a dozen; 100 gram lots, $1.00 each; 500 grams, $3.50. Prepared for analysis; composition given on detachable portion of label. Complete details on request.

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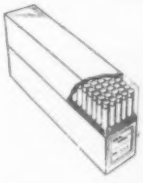

Each contains fifty or one hundred vials, adequately indexed, small enough to be carried about the laboratory. Keeps many small samples in orderly arrangement, indexed for quick reference; collections of samples having special interest will in time be of greatest value; various models. Write for Leaflet 404.

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Each set contains the sixty substances and reagents suggested in Chamot and Mason's Handbook of Chemical Microscopy. Set No. 1, used with volume I, for physical methods; set No. 2 (used with volume 2) for inorganic qualitative analysis. Each set $17.50. Descriptive leaflet on request.

The methods of chemical microscopy offer important advantages that should be fully appreciated by every progressive chemistry teacher and every industrial and research chemist.

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Manufacturers and Distributors

44 Whitehall St., New York

CHARLOTTE COLLOID MILL PORTABLE LABORATORY MODEL

For School and College Laboratory Use

Many school and college laboratories have frequent use for a high-speed emulsifier and disintegrator, in which liquids, solids in liquids, and pastes, can be finely dispersed, disintegrated and homogenized.

The **Charlotte Colloid Mill** is well known in the process industries for its efficiency in producing all types of emulsions; suspensions; the thorough blending of ingredients to bring out and incorporate color or flavor; the improvement of texture; the disintegration and dispersion of solids in liquid media, and the grinding and extraction of fibrous materials. It is widely and successfully used in the following industries: food products, cosmetics, pharmaceutics, paint and pigments, polishes, asphalt and tar, rayon, rubber, carbon paper, paper, dyestuffs, ink, flooring and textile industries.

The ability of the **Charlotte Colloid Mill** to produce an absolutely standard, uniform product, which is superior due to the thorough blending of all ingredients; its consequent saving in the amount of material necessary to obtain a desired color or taste; its adaptability for emulsions, disintegrations, or suspensions; has been by now thoroughly demonstrated.

The New Charlotte Portable Laboratory Model is particularly well adapted for educational development and laboratory experimental work in schools, as well as for plant and laboratory research, etc., in the process industries. Incorporated in it are all of the features to be found in the larger sizes of the **Charlotte Colloid Mill** with the additional advantage of easy portability.

Being a self-contained unit with the motor and mill all mounted on one base, it does not therefore require a special base. It will operate on a table or stand, and can be readily moved from one department to another, or it may be mounted on a platform truck when operations require bringing it to the various feed or supply tanks.

How it works: The materials to be dispersed, disintegrated, emulsified or homogenized are brought to the inlet of the mill by gravity. From this inlet, the speeding rotor by its action forces the product through the gap between the rotor and stator, thence through the outlet of the mill. The mill is easily cleaned and readily dismantled for inspection.

Specifications: Weight, 200 lbs. net
Speed, 3600 r.p.m.
Adjustment, external
Motor size, 1 hp.
Capacity, 1 to 10 g.p.h.
Inlet, ¾"
Outlet, ½"
Rotor and Stator, 2" x 2½"
Power required (water), ½ hp.
Floor space, 14½" x 34"

Construction: Monel metal material chamber, inlet, outlet and feed funnel; i.e., all parts coming in contact with material are of Monel metal.

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E&D Filter Papers are sold by all laboratory supply houses, under their label or the E&D label. Upon your request to them, they will supply you with our paper under the E&D label; **then you will be sure that you are getting E&D quality.**

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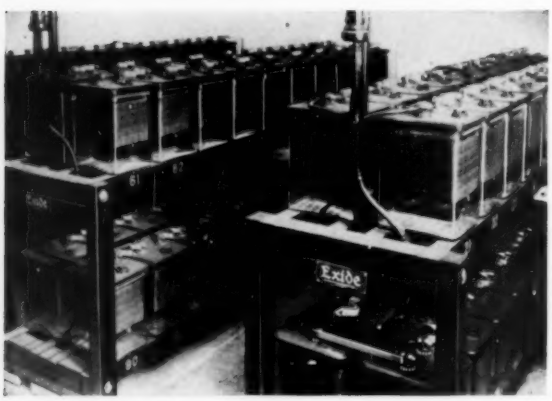

Left—120-CELL EXIDE CHLORIDE LABORATORY BATTERY IN USE AT CRUFT LABORATORY, HARVARD UNIVERSITY, CAMBRIDGE, MASS.

Right—AN EXIDE CHLORIDE LABORATORY BATTERY CELL CUT AWAY TO SHOW CONSTRUCTION; SEALED GLASS JAR ASSEMBLY

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The FILCO plate and frame filter presses operate equally well with filter paper, filter cloth, filter-aids and asbestos pads. They are easily adjusted to filter large or small quantities.

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NO. 432 FILTER PAPER

No. 432 is a specially finished white paper of medium close texture. A fine paper for general laboratory use, for schools and hospitals, it is widely used also industrially, alone, or with other papers for polishing.

NO. 716 FILTER PAPER

No. 716 is an inexpensive creped-surface, heavy, white, strong filter paper widely used commercially because of its strength, in the filtration of extracts, essences, perfumes, lacquers, biological products, etc.; used also for filtering caustic solutions, for use in Buchner funnels, for removing water from gasoline, clarifying vegetable oils for cold tests, standard for the Merrill Precipitation process, for use in filters and filter presses, with or without cloth, in filtering oils, chemicals, beverages, extracts, etc. It is an ideal paper for the filtering of glycerine solutions.

NO. W-1-D FILTER PAPER

This is an exceptionally fine smooth-surface, white filter paper for general qualitative work and for filtering ordinary precipitates. It is extensively used in the volumetric determination of silver and carbonates, for filtering solutions, sugar, ammonium, phospho-molybdate after digestion, liquids containing lead sulphate, in determining phosphorus in fertilizers, for filtering sulphides, hydroxides, etc.

NO. 916 GRAY FILTER PAPER

No. 916 is a creped-surface paper of open texture used extensively in filtering extracts, essences, tinctures, etc. It may be used for the same purpose as No. 516, at a somewhat lower cost.

All of the above described grades as well as many other imported and domestic filter papers to meet all requirements are available in all sizes and shapes.

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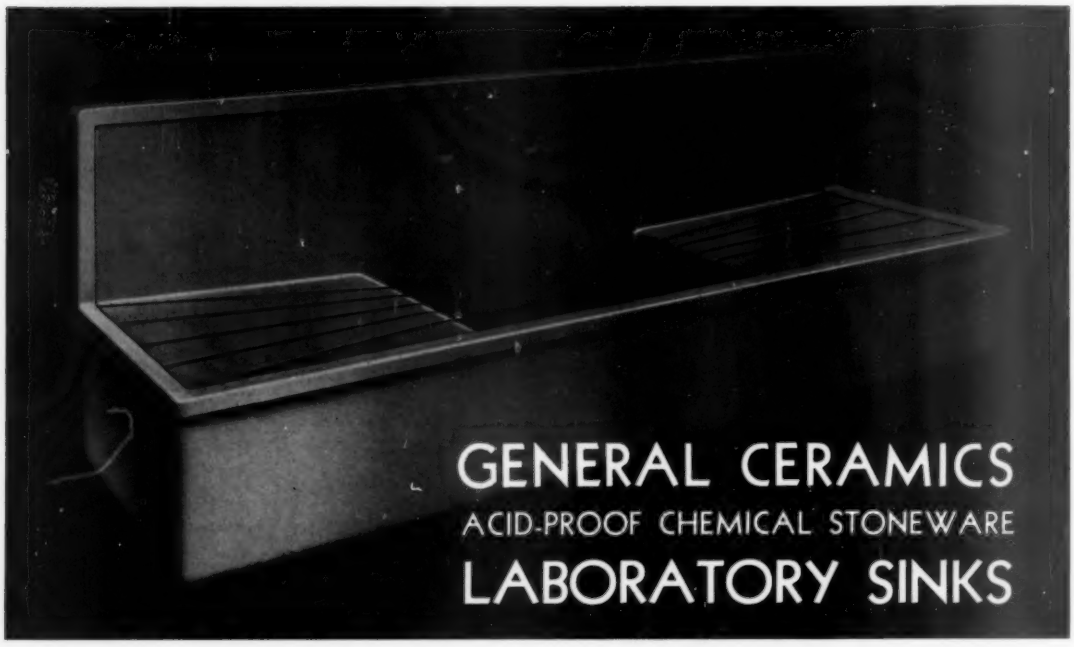
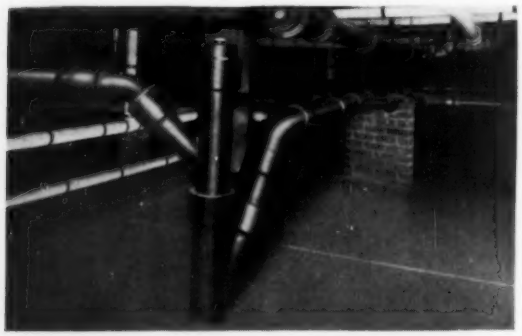


A list of the colleges and universities with chemistry laboratories equipped with General Ceramics Chemical Stoneware is practically a roster of our leading institutions of learning, including among many others Yale, Harvard, Vassar, Radcliffe, Duke, Pittsburgh, Wesleyan, Lehigh, Tulsa, Toledo, Berea, Purdue, Vanderbilt, McGill, and the State Universities of Maryland, Illinois, New Hampshire, Connecticut, Indiana, Pennsylvania, Ohio, Wisconsin, Nevada, California, and California at Los Angeles, as well as hundreds of research and industrial laboratories throughout the United States and Canada. Typical items of General Ceramics equipment include pumps, exhausters, storage vessels, stills, kettles, chlorine generators, filters, funnels, tanks, pots, mariotte bottles, subliming dishes, acid jugs and pitchers, piping, traps, troughs, valves, and fittings.



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General Ceramics Chemicalware is acid-proof through and through. Its attractive smooth surface glaze is an integral part of the ware itself and therefore free from crazing or cracking. General Ceramics ware is mechanically strong, leak-proof, and easy to keep clean, and it cannot contaminate the chemicals being handled. It lasts indefinitely and there is no upkeep or replacement expense.

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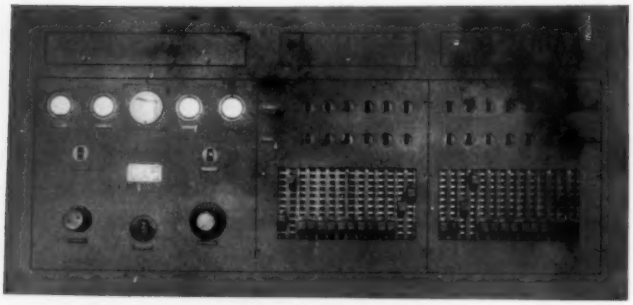


CORDLESS TYPE PANEL

Electrical Distribution Equipment for Science Laboratories

CORDLESS TYPE

The conducting of electrical experiments in present day High School and College laboratories requires adequate equipment properly installed and connected if best results are to be attained and the time of students and instructors is to be conserved. Since 1910, we have been manufacturing and supplying schools and colleges with electrical equipment and improving the apparatus wherever possible.

Particular attention is invited to the new cordless type distribution panels shown above on this page. This type of panel (patent pending) was developed and first exhibited by Holtzer-Cabot at the N. E. A. Convention in Minneapolis in 1933 and is a basic and vital improvement over the plug and cord type panel heretofore used.

In this new type panel the selection of all voltages to be connected to students' tables or instructors' benches is done by switches or sliding plugs which cannot be removed from the panel. Not only does this eliminate all plugs and cords with their inevitable upkeep expense and occasional loss, but by means of careful design the new panel positively eliminates any possibility of wrong connections or reversed polarity. It is not possible by any manipulation of switches or sliders to get more than one voltage on any bench circuit at the same time. All equipment is rated and tested for 30 amperes at 115 volts.

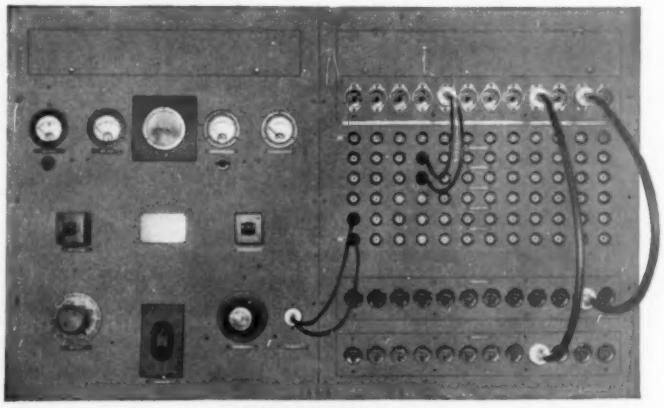
With the elimination of plugs and cords and by improving the motor generator and battery control panel we are now able to install any panel in a case not over 7″ deep, thus making these panels entirely practical for installing flush in laboratory walls. As these panels are of the dead front type, the glass paneled doors usually furnished for cord type panels are unnecessary and are not furnished.

Referring to cut on page above, it will be seen that there are two sliding plugs for each bench circuit—one colored red and the other green; the red being positive. By sliding the plugs to the proper position plainly marked on panel front and plugging them in, any battery voltage from 2 to 24 can be connected to bench circuits. The switches marked "AC" are so connected that in the "up" position they connect the bench circuits to the "AC" line and in the "down" position the bench circuits are transferred to the "DC" switches below. The "DC" switches operate in the same manner, connecting when in the "down" position the bench circuits to the battery voltage section below.

Holtzer-Cabot cord type panels have been continually improved and are now furnished with special heavy duty receptacles, securely locked to the panel so as to prevent any chance of loosening or turning. Special plugs and receptacles up to 200 ampere capacity can be furnished.

All equipment is listed and approved by the Underwriters' Laboratories.

See pages 72, 73 for Holtzer-Cabot Electric Clock, Telephone and Fire Alarm Systems.



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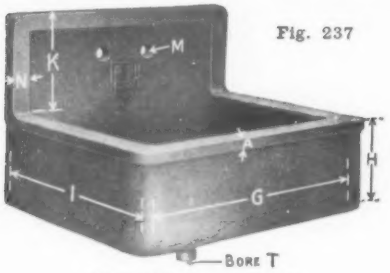

Fig. 237

KNIGHT-WARE SINK

DEAIRATED KNIGHT-WARE

Deairated Knight-Ware is an improved ceramic product having a dense, uniform body which is tough, thoroughly vitrified and wholly inert to the action of acids, alkalis, and corrosive solutions and gases, weak or strong, hot or cold. Its acid-proof qualities do not depend upon any glaze, enamel, or veneer, "It is the body itself". Deairated Knight-Ware is not brittle or fragile as ordinary tile, and is equaled only by glass or fused silica in chemical inertness. An installation of Knight-Ware properly made is trouble-free and permanent.

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Pipe and Fittings for Laboratory Waste Lines and Fume Ducts.

Custom Built One-piece Laboratory Sinks.

Laboratory Table Troughs.

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Your laboratory sink is built in one-piece to your measurements. Backs, drainboards, aprons and outlets are available as an integral part of the sink.

Fig. 268

KNIGHT-WARE S-TRAP WITH CLEANOUT

SOME NOTABLE INSTALLATIONS OF KNIGHT-WARE EQUIPMENT

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Single Ranges—
From 3 microamperes to 1 ampere, full scale.
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Multimeters — 14 Ranges—
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TYPE 505

TYPE 507

Same ranges as Type 501. These cannot be supplied with internally mounted thermocouples.

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No power consumption on D.C. and very little on A.C. Full scale ranges from 120 to 3000 volts, and up to 40,000 volts by the use of condenser multipliers. Measures true R.M.S. values. Special high ranges built on request.

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The most sensitive portable meters manufactured. Although movement is carried on a suspension, the meter needs **no leveling.** Full scale ranges from 0.5 microampere and 0.1 millivolt up. Also supplied in multiranges.

Type 5053—Similar to Type 505 but with semi-suspension element. Ranges from 0.75 microampere and 0.24 millivolt up.

Type 5073—Similar to Type 507 but with semi-suspension element. Supplied in same ranges as Type 503. Price approximately 30% less than Type 503.

TYPE 503

NEW DEVELOPMENT RAWSON TWIN MULTIMETER

Occupies less space than any other near equivalent meter. Covers all ranges of types 501 D.C. multimeter and 502 A.C. multimeter —29 in all.

TYPE 5012
Size 12" x 8" x 6"

THE AMERICAN SCHOOL AND UNIVERSITY

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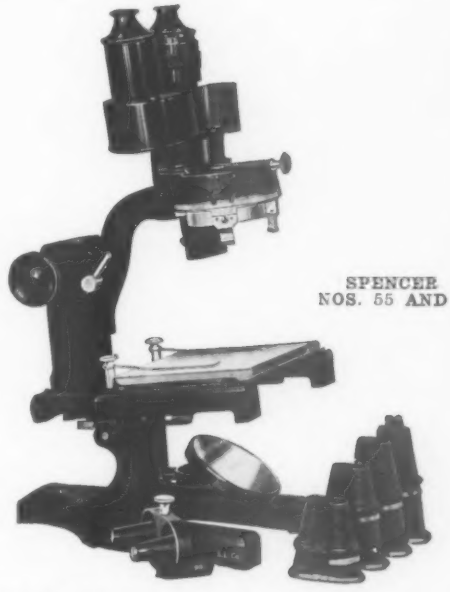
The Spencer Lens Company have been pioneers in microscope-building, the first Spencer microscopes being made more than 75 years ago. They were the first to build apochromatic objectives; the first, and for a dozen years the only, manufacturer in America to build microscopes with side fine-adjustments; the originators of the attachable mechanical stage that clamps on the side of a microscope; the originators and only builders of fork-type substages, converging tube binocular microscopes, combination binocular and monocular body all in one, combination substage condenser and dark-field illuminator. In short, most of the improvements in microscope construction during recent years have originated in our factory.

Most laboratory workers prefer Spencer microscopes not merely because the Spencer Company were pioneers, but because they have continued to pioneer all down through the years to the present day.



SPENCER
NOS. 55 AND 56

SPENCER NOS. 55 AND 56

These exceptionally large instruments meet in a most satisfactory way the demand for a large stage. The plate glass stage is 100 mm. x 100 mm. Objects in the center of a dish 50 mm. high and 130 mm. in diameter may be brought into the lines of vision. (Illustrated above.)

SPENCER NO. 33-MH

Embodies all features essential for practical diagnosis. Features the exclusive Spencer constructional advantages: (1) Balanced Optical System, (2) Dual-Cone Nosepiece, (3) Fork-Type Substage and (4) new Rhodium Plated Parts. Mechanical stage has range sufficient to cover 3" x 2" microscope slide. Has micrometer fine adjustment with twenty-seven threads completely engaged. It is the finest microscope for the medical student's use.

SPENCER
NO. 33-MH

SPENCER NO. 66

For elementary work, precisely built and durable, it serves the same purpose as more expensive instruments. Standard size in every respect. Standard Spencer objectives and eyepieces; rotatable disc diaphragm. Fine adjustment has twenty-seven threads of the screw engaged instead of the usual six. Simple in operation, it is the finest instrument for students untrained in handling a microscope.

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PRODUCTS

Water Stills	Distilling Apparatus
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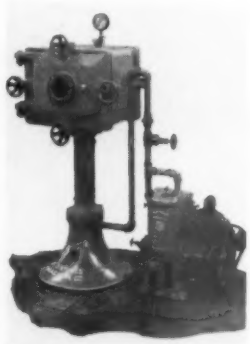
Vacuum Rotary Dryers	Mixers
Vacuum Evaporators	Kettles
Atmospheric Shelf Dryers	High Vacuum Pumps
Tablet Machines	

Stokes No. 171 One Gallon Automatic Water Still. Gas-heated model

For the economical production of distilled water of exceptionally high chemical and bacteriological purity for chemistry, biology and physics laboratories, this Stokes No. 171 Still has a number of exclusive features which assure the high quality of the distillate as well as increase convenience of operation.

Among the features of this still are a Pyrex glass cover, triple vapor baffle, solid block-tin condenser tube, gas eliminator, deconcentrator (especially important in hard water districts) and, in the case of the electrically-heated still, a patented dual-purpose safety device which protects the heating element.

This still—of modern laboratory finish—is supplied steam, gas or electrically-heated with a wall bracket, though floor stand is available. It is easy to install and clean and operates automatically. The capacity is one gallon per hour. Other standard models from ½ to 100 gal. per hour capacity are available. **Write for literature and quotations.**



Stokes No. 51 Laboratory Vacuum Shelf Dryer, with High Vacuum Pump

For vacuum drying and evaporating required in technical school and university laboratories, the Stokes No. 51 Laboratory Vacuum Shelf Dryer is available. The design is compact with the condenser and receiver making up the stand for the vacuum chamber itself. The vacuum chamber contains two shelves 18″ x 12″ with a 4″ clearance between them. Each dryer is supplied complete with vacuum gauge, vacuum break valve and either thermometer or steam pressure gauge. The finish is of gray enamel with handwheels, sight-glass covers and fittings nickel plated. Heating is by steam, or hot water with the necessary auxiliaries.

Either the rotary, oil-sealed type Stokes No. 146 High Vacuum Pump (as illustrated), which maintains a vacuum within a fraction of a millimeter of barometer, or belt or motor driven reciprocating types of vacuum pumps may be supplied as required. **Send for literature and quotations.**

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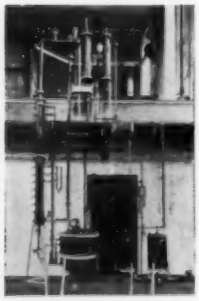
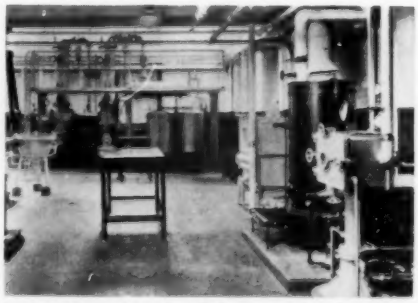
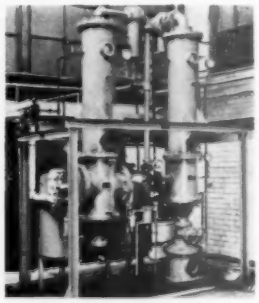
For a number of chemical engineering laboratories we have supplied special equipment of the type illustrated below. This apparatus is built to specifications and our chemical engineers are available to work out with laboratory directors the apparatus and auxiliary equipment. **Write us concerning your requirements.**



Fractional Distilling Apparatus specially designed so that all engineering data can be obtained—as installed at several universities.



Installation view in Princeton chemical engineering laboratory. Note double-effect evaporator and No. 51 Vacuum Shelf Dryer. Fractional Distilling Apparatus not shown. Similar equipment installations made in several university laboratories.



Double-effect evaporator as installed in the laboratory of the University of Pennsylvania. Arranged so that either effect can be operated independently. Second effect arranged for crystallizing.

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Illustrated are a few of the many Weston models particularly recommended for educational use. Catalogs describing all models are available.

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*** PHOTRONIC**
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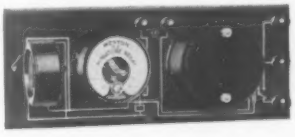

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* PHOTRONIC—a registered trademark designating the photoelectric cells and photoelectric devices manufactured exclusively by the Weston Electrical Instrument Corp.

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by Dr. B. Lange

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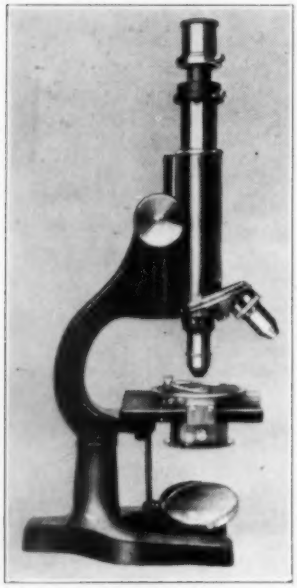
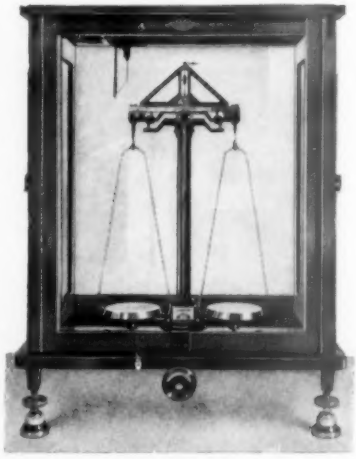


ANALYTICAL BALANCES



The famous Sartorius balances are available in all types from the simple Student Balance to the new Micro-Balance. Improved models include air-damping, projection reading of scale, mechanical manipulation of fractional weights from outside the case.

The specially designed micro-chemical microscope at the left is equipped with accessories for polarization. Without these attachments the instrument is an ideal moderate-priced microscope for biology classes, etc.

THE AMERICAN SCHOOL AND UNIVERSITY

Section IX

SHOP PLANNING AND EQUIPMENT

The Physical Plant for a Modern Program of Vocational Education

BY F. J. JEFFREY

ASSISTANT SUPERINTENDENT OF INSTRUCTION, BOARD OF EDUCATION, ST. LOUIS, MO.

IT IS obviously true that the best job cannot be done with poor and defective tools in makeshift building accommodations. It is equally obvious that over-equipment in a palatial building will not of itself produce a fine institution. The successful development of a vocational school is more dependent upon the selection of an efficient personnel and its training upon the job through experience than upon a fine building and elaborate equipment. The development of a small, efficient faculty under fairly reasonable material conditions is the best start for a school that is breaking away from the time-honored traditions of secondary education, for as progress is made and the need for expansion occurs, involving new buildings and new equipment, additions to the faculty can be made with little danger of changing the major objectives.

The history of the Hadley Vocational School in St. Louis parallels that of similar institutions in other localities. Starting in a few vacant rooms not needed for any other purpose, to care for boys not adaptable to the routine of the regular school, and to provide for the part-time continuation classes of boys and girls forced upon the school system by law, it next had assigned an old elementary school building left vacant by shifting population, then another such building and some rented quarters, and, finally, a new structure. When the need of a new building became demonstrable, members of the Board of Education, with their Commissioner of Buildings and the Principal of the Vocational School, visited many cities to examine vocational and technical high schools, obtaining many suggestions and ideas for planning a building that would accommodate the units of the school as it then existed and allow for expansion in the number of students and also in the activities to be carried on.

The plan formulated embraced three units for a plot of ground centrally located—one unit for immediate erection, and two to be held in reserve until the need for further expansion was shown. It was evident that the major growth in the school's enrolment would be for the pre-employment training of boys and girls of high school age who would enter industrial and commercial life after two or four years of attendance, with a slightly lesser need in point of numbers for extension training in evening and part-time classes. One of the two units to be held in reserve was to care specifically for commercial and technical training, the other was to house an auditorium, gymnasiums, student cafeteria, and classrooms, temporary arrangements for all these functions being provided in the unit to be first constructed.

THE HADLEY VOCATIONAL SCHOOL, ST. LOUIS

Building operations were started in 1930 and completed late in 1931, with the building about half equipped, before the finances were cut off. The depression has altered the problem in many ways other than financial, particularly in sending into the school for whole-day attendance many more boys and girls between fourteen and sixteen years of age than was originally estimated, and lessening the number of part-time and apprentice students and increasing the number of high school graduates enrolling for short-time programs.

Planning for Expansion

The present building, which was occupied in a partially completed condition in December, 1931, is of U type, five stories in height, one block along each leg of the U, containing approximately 250,000 square feet of floor space usable for shops and classrooms, exclusive of corridors, storeroom and toilet rooms, and includes, as an integral part, the shops of the old Central High School, the main building of which was so damaged in the cyclone of 1928 that it had been torn down. The reinforced concrete construction with floor slabs as an integral part of the building obviates the necessity of any weight-carrying partitions within the building. The corridor partitions are of brick or tile construction designed to carry all the ventilating pipes, conduit and plumbing, and contain, on the corridor side, the student lockers. The partitions are so arranged and designed that the removal of a block of three lockers at designated points allows access to a service-well through which new conduit or plumbing can be brought from the service basement without piercing the floor slab. The advantage of this arrangement in providing for expansion in the training program was shown in 1934, when a course in cosmetology was introduced. By the removal of a tier of lockers all the necessary plumbing for five shampoo basins and a service sink was installed within the corridor partition without drilling the floor slab and by piercing the side wall only for the necessary pipes.

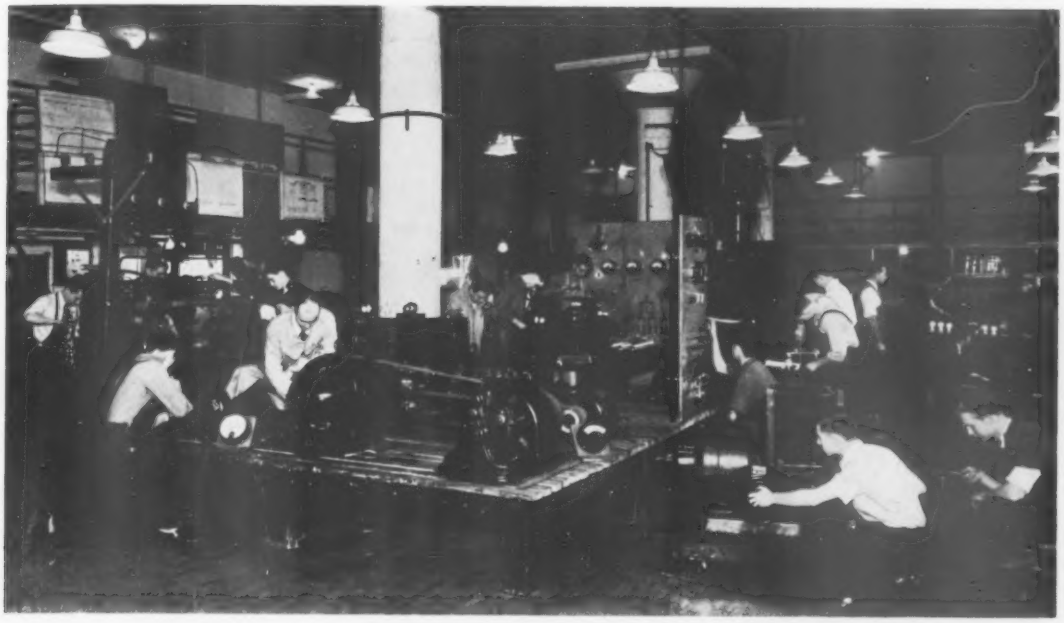
Movable Metal Partitions

The division of the interior space into shops and classrooms is accomplished by means of fabricated metal partitions which may be removed and re-erected with a minimum of labor cost, and without the muss and confusion usually associated with such a change. It has been demonstrated in the school that such partitions can be removed and re-formed as a pupil project. The south side of the U is of the usual school construction, plastered walls except for these metal partitions, linoleum floors and the like, housing the offices, library, and classrooms. The east and west sections are of factory type construction intended eventually for shops, with brick corridor walls, wood or cement floors; the height of ceiling and strength of construction permitting the use of heavy machinery in any part of these two sections.

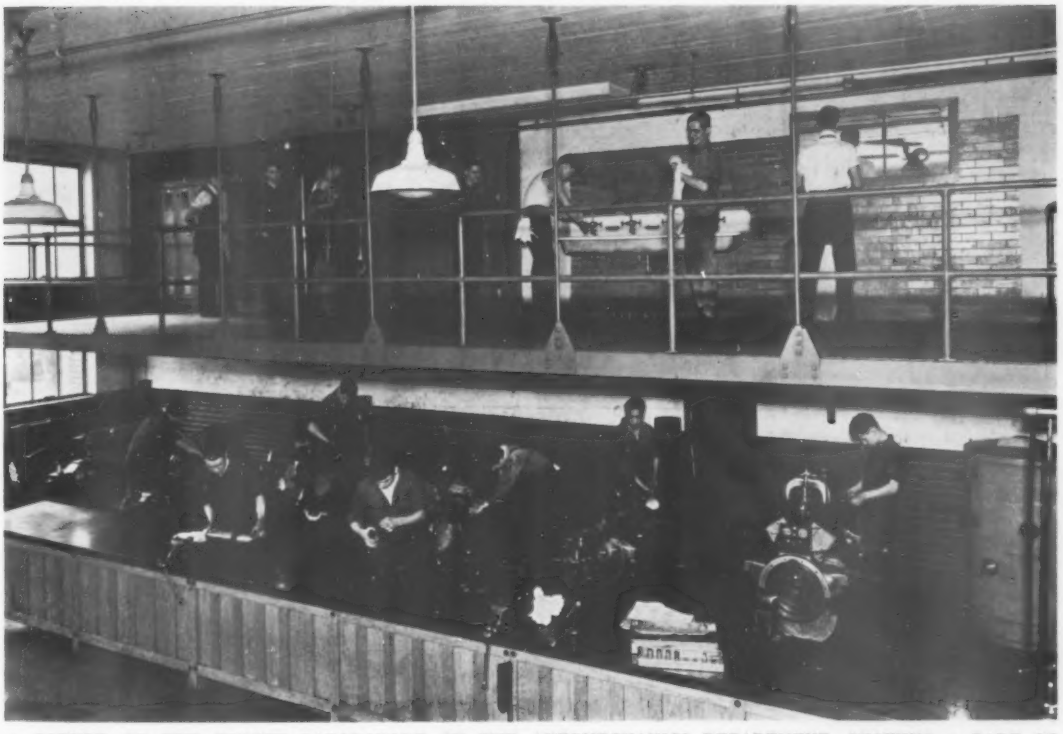
ONE SIDE OF THE MILL ROOM OF THE WOODWORKING DEPARTMENT, SHOWING THE WINDOW ARRANGEMENT USED IN ALL PARTS OF THE BUILDING

Subsequent to the taking of this picture, a dust-collecting system was designed, fabricated, and installed in this room by the students of the Sheetmetal Department

At present most of the fourth and fifth floors is used for the Commercial Department, the divi-



THE ALTERNATING CURRENT LABORATORY OF THE ELECTRICAL DEPARTMENT
All equipment in this room was installed by the students



A CORNER OF THE ENGINE LABORATORY OF THE AUTOMECHANICS DEPARTMENT, SHOWING A PART OF THE BALCONY ARRANGEMENT INSTALLED IN ALL SHOPS, CONTAINING LOCKERS AND WASH TROUGHS
Water and exhaust connections for the engines are made by pipes in the floor

sion of space being accomplished by these easily removable partitions. The plan of the fourth floor shows ten such rooms along the north side. This division of space may be easily altered to provide for any shop activity that may later be developed. The student cafeteria, seating 1,100, with its open kitchen now occupies the undivided space on the east side of the U on the fifth floor. If and when a later unit of the building is erected to house the cafeteria, the space will be subdivided by the partitions taken from other parts of the building.

Control of Outside Light

All parts of the building are provided with steel-framed windows giving the maximum of light, which can be opened to make an almost open-air room. Diffusing glass is used in the upper half of each window, making shades unnecessary in the rooms used for shops, nor are shades needed in the recitation rooms on the north side of the building where the direct rays of the sun do not strike. Excess of light in other parts of the building is controlled by Venetian blinds with the least up-and-down movement of the shade by altering the slant of the slats. Experiments with various types of shades showed that Venetian blinds were the most satisfactory with our wide expanse of window opening and although high in first cost would be most economical in upkeep.

Lockers and Wash-Troughs on Shop Balconies

All shops are provided with a balcony along the corridor side of the room, with a sufficient number of lockers for storing working clothes for both day and evening students. Wash-troughs are provided on these balconies to enable the students to clean up without leaving the shop. Since the students are under the direct observation and supervision of the instructor, the many disciplinary troubles arising from separate wash-rooms are avoided. The balconies are sufficiently wide and strong to provide storage room for bulky equipment that is but occasionally used. The space beneath is available for shop purposes or may, by the erection of partitions, be used for tool-cribs. Each room that may be eventually used for shop is provided with conduit laid in the cement floor slabs so that electric connections can be made in any one of five positions in each section of 20 feet square by the running of wires through these conduits to the proper connection box.

The foregoing accounts for some of the results of planning for flexibility in building arrangements. It does not take into account the many consultations of the Building Department with the teaching force to make sure that every specific need of the school then existing was properly cared for. It does attempt to account for the planning of a building in such a way that any existing use of a room or shop might be discontinued and the space made available for other use not then apparent, and also for the temporary use for an activity in the program that would eventually be transferred to new quarters later. To make sure that no false impression is made by this article, it will be mentioned briefly that all necessary arrangements were made for bell signals, telephone communication, radio and public address connections, elevator service for both passengers and freight, storage of supplies, adequate pupil accounting and advisement, medical inspection and service, student cafeteria, playground roof, athletic field, safety devices, ventilation, heating, and all the other multifarious details that form a part of the modern school for secondary school age students.

Some Advantages of Flexibility

One result of a flexible purpose building experienced as early as the original planning period and during the construction, was the separation of planning for the building, and planning for equipment. It was possible to alter the equipment plans very materially while the construction was in progress without incurring the ire of the architect nor the introduction of extras which are the delight of low-bid contractors. That advantage has been further manifest during the four years' use of the building, one notable example being the moving of an electric shop and the conversion of the space vacated into a drawing room by the services of the students and assistance of the custodian force without calling in mechanics to help, furnishing actual work for the training of students with no expense other than for materials.

The Cooperation of Industry

Our experience has shown that the selection of equipment solely by teachers aided by manufacturers and the architect and builder will lose one of the most valuable opportunities of selling or popularizing the vocational program to the community. Bringing into the school interested workers and employers for their advice and counsel has resulted in securing the active support of these citizens after the equipment was in place and the school running. Of course, the school must make good to continue to receive support as the years roll on, and must keep alive the lines of communication with industry by producing a student product that can be used. The school has had the advantage of advisory committees from industry in a number of lines. These have, in part, been informal groups of individuals giving us their attention when called upon and, in other cases, rather formal groups offering continuing advice and criticism. In some lines the school has taken the initiative in calling upon groups or individuals to work in the development of courses or in the selection of equipment, while at other times committees from employers' or labor organizations have sought the cooperation of the school.

COSMETOLOGY SHOP INSTALLED AFTER THE COMPLETION OF THE BUILDING

The plumbing for the five shampoo basins and the service sink was installed within the service partition by removing the lockers on the corridor side. The tables, mirror frames, and screens were constructed in the school shops

THE KITCHEN OF THE CAFETERIA-TEAROOM COURSE

This is connected to a tearoom seating 40 and a cafeteria seating 60. This is separate from the main student cafeteria, which seats 1,100 and which is not used as a teaching project, because of its size

The set-up of the public school in this city does not compel the formation of advisory groups, nor does it permit the granting of any authority to them. Cooperation of the school with industry is upon an entirely voluntary basis. Brief statements of the functioning of this cooperation in two cases will illustrate. Each of the major shops of the school has been planned and equipped in accordance with advice received from a committee from industry. This has resulted in some instances in the saving of money by the elimination of equipment specified by the teachers but not considered by the trade to be essential in the fundamental training of youth in pre-employment courses. In one notable instance—the machine shop—the advice received materially increased the cost over that by which it would have been possible to fill the shop with the tools for carrying on the course. The committees of employers and foremen that advised us, regarding both the course and the machine tools needed to carry out the instruction, had in mind the training both of youth and of journeymen in extension courses and were quite specific .n the matter of size and quality and makes of machines to be purchased, and equally specific in the matter of machines to be avoided.

The educational committee of the St. Louis National Hairdressers Association made contact with the school of their own initiative and, upon being assured of the cooperation of the administration, petitioned the Board of Education for the introduction of a course in cosmetology at a time when no money was being spent at the request of the teaching force. This committee planned the laboratory arrangement, drew up the general specifications for equipment, assisted in the selection of a teacher, and supervised the initial stages of the course. The committee was also of invaluable assistance in overcoming the opposition of a state organization largely under the domination of the proprietors of local private schools. Much if not all of this opposition has disappeared through a better understanding of the operation of such a course under public school auspices, and through the high standing which the course has attained by the supervision of this advisory committee.

OTHER MATERIAL ON VOCATIONAL EDUCATION

An article on

Equipment for Industrial Education
By O. D. Adams, State Director for Vocational Education, Salem, Ore.

will be found on pages 314-315 of the sixth edition (1933-1934) of The American School and University.

On pages 349-353 of the seventh edition (1935) are the following articles:

Shop-Planning Principles
By William L. Hunter, Head of Industrial Arts Department, Iowa State College, Ames, Iowa

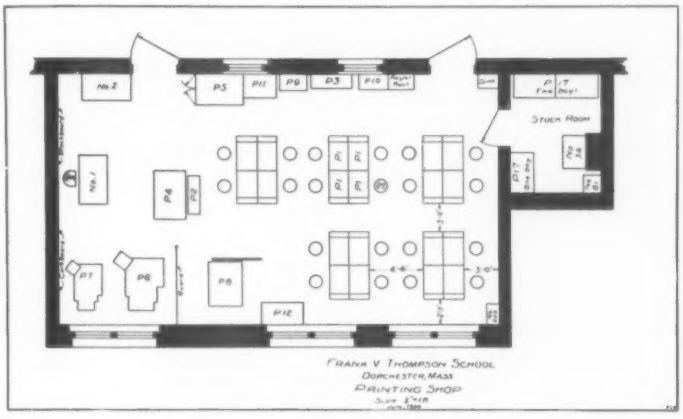
Planning the Vocational School Plant for Future as Well as Present Needs
By Robert O. Beebe, Director, Essex County Vocational Schools, Essex County, N. J.

These volumes are available at $2.50 a copy.

A New Printing Shop in the Frank V. Thompson School, Dorchester District, Boston

BY EDWARD C. EMERSON
ASSOCIATE DIRECTOR OF MANUAL ARTS, BOSTON

I AM writing of this school, not because it contains our only print shop (we have thirty in the Intermediate or Junior High schools in Boston), but because it happens to be our youngest, Printing has been an extremely valuable and popular addition to our shop activities. Our first shop was opened in 1909, and the subject has been taught in the schools below the secondary schools since 1912.



Printing is not only a good outlet for boys with strong motor tendencies and a good balance for other shop activities, but it is a great help in other studies, especially English. The use of correct words, spelling and punctuation are essential to good printing. The evidence of the press proof and the finished sheet is compelling and final.

Then, too, the printing shop is a useful shop. The principal and the school departments always have something to print. This must be carefully guarded, however, as a printed sheet or pamphlet has a very official cast, so a job that might affect more than the home school must have the approval of the proper authority, usually the Superintendent. All this sounds very businesslike and professional, but it must be manual training and not trade training. We must not attempt to make tradesmen of Intermediate School pupils. No job must ever be taken for individuals. No work is accepted on a commercial basis, but an individual pupil may occasionally (not more than twice in any one year) do a small job as an individual project for his father or mother, or some society in which he is personally interested.

Linoleum block cutting and printing is well worth while and adds much interest to the work of the shop. It is useful for Christmas cards, the school paper, bookplates, and much besides. Furthermore, it is inexpensive. A little battleship linoleum, some mounting blocks, which can be cut to size in the woodworking shop, a piece of an old umbrella rib, and a broken hack-saw blade properly handled and sharpened, and we have the necessary equipment. With a little care in design, drawing and transferring, and a little practice in tooling, truly marvelous results are obtainable. Even color work may be attempted.

Every new shop brings its own problem. The older the building, the greater the problem. For new construction we have our standard layouts, and the architect does the worrying.

In the Frank V. Thompson School we had a comparatively new building, but a room that had been planned for a machine shop. It lent itself very well to the new activity, although a few things are not ideal. This is particularly so in

A VIEW OF THE PRINTING SHOP

the position of the stock room. We should like to have this near the cutter for the easy routing of jobs, but we had to choose between adequate light for composition and a little longer carry for the stock. As a boy's eyes are less easily mended than tired legs, and certainly worth more than a few minutes of time, we decided in favor of the case stands.

Each one of these cabinets is equipped with 16 California job cases. Each boy has his own case of body type, for which he is responsible. We tried years ago to economize by having different boys use the same case, but it did not work well. Every error was the other fellow's fault, because the case wasn't clean. Now each boy has his own and there is no argument. Of course the display and special cases must be used in common.

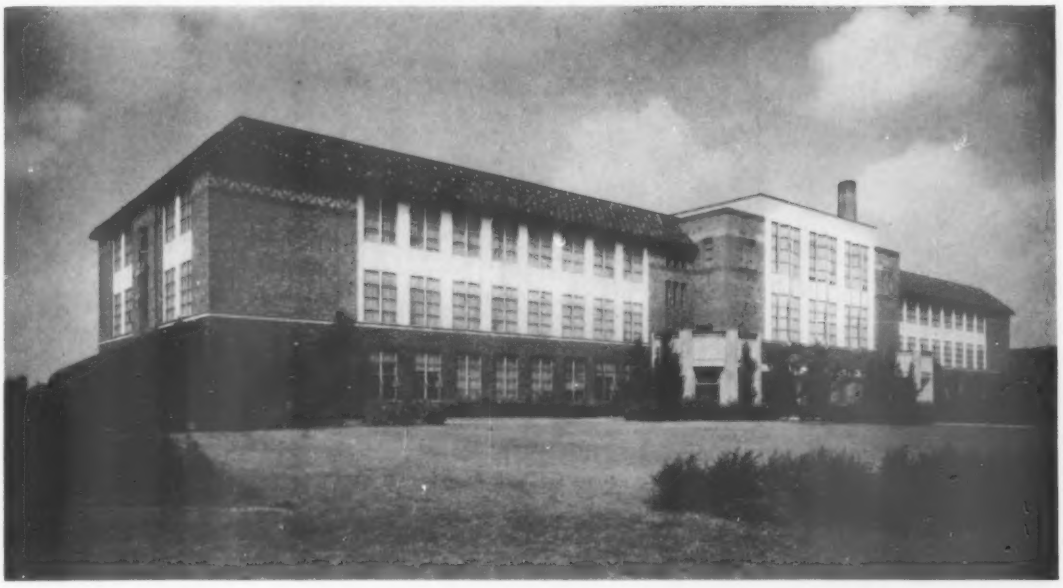
In the Boston schools shop work is required through the eighth grade and is an elective in the ninth grade and high schools. Boys in grades seven and eight may elect to major in the subject. In the Thompson school there are 428 boys in shop classes, and 60 in shop clubs. Of these, there are 141 in the print shop for their regular shop periods, and an additional shop club of 20.

The shop equipment is listed below in some detail. A full description of type faces is not given, since that is a matter largely of individual preference. The numbers refer to the position of the piece of equipment on the plan.

No. 1 Teacher's desk
No. 2 Teacher's table
No. 3 Teacher's chair
Visitor's chair
No. 81 Teacher's locker
No. 34 Supply cabinet
No. 12 20 stools, 30"
P—1 10 case stands, with 16 California job cases and one blank case for each stand. Each accommodates two pupils.
P—2 Proof press
P—3 Galley cabinet, with 100 steel galleys 8¾" × 13"
P—4 Imposing table
P—5 Combination press-room cabinet and drying rack
P—6 Printing press 10" × 15", with 1/3-hp variable-speed motor
P—7 Printing press (foot power) 8" × 12".
P—8 Paper cutter, 26"
P—9 Staple binder, foot power
P—10 Lead rack stack
P—11 Type cabinet. Top drawer, blank case. Second drawer to have 4 quarter-size rule cases. Third drawer to have 1 metal furniture case. Fourth drawer to have 1 space and quad case. All other drawers to have California job cases.
P—12 Drying rack
P—13 Lead and rule cutter
P—17 Steel storage shelving. Ledge type with backs and partitions.

Other Equipment

Ink fountain for 10" × 15" press
Marble ink slab 10" × 15"
Mitering machine
Body type to fill individual cases, 45 20-lb. units 10 point Century Old Style, with several fonts of small caps
2 borders, 12-pt. and 6-pt.
100 lbs. leads and slugs
40 lbs. brass rule, 4 sizes
24 ft. brass rule in strips
80 lbs. quads and spaces, 4 sizes
11 fonts quads and spaces, 14-30 pt., 4 sizes
6 fonts braces and dashes, 6 sizes
8 fonts leaders, arithmetic signs, parentheses and fractions
1 font labor-saving furniture, 10-60 picas
50-lb. font labor-saving metal furniture
22 job fonts Caslon Heavy, 8 sizes
10 fonts Century Old Style, 5 sizes
1 20-lb. font Century Old Style, 8-pt.
9 job fonts Century Old Style Italics
16 job fonts Heavy Copper Plate Gothic, 8 sizes
9 job fonts Engravers Old English, 6 sizes
Inks—Bond Black, Job Black, ¼-lb. tubes blue, red, yellow
Benzine brush, one doz. gages, 2 overlay knives, 6 prs. tweezers
Composing sticks, 20 8" × 1⅛", 3 8" × 2", 1 12" × 2"
Planers, quoins and quoin keys
3 boxes of staples
Stock as required



Technical Education in Chadsey High School, Detroit

BY EARL L. BEDELL

ASSISTANT DIRECTOR OF VOCATIONAL EDUCATION, DETROIT, MICH.

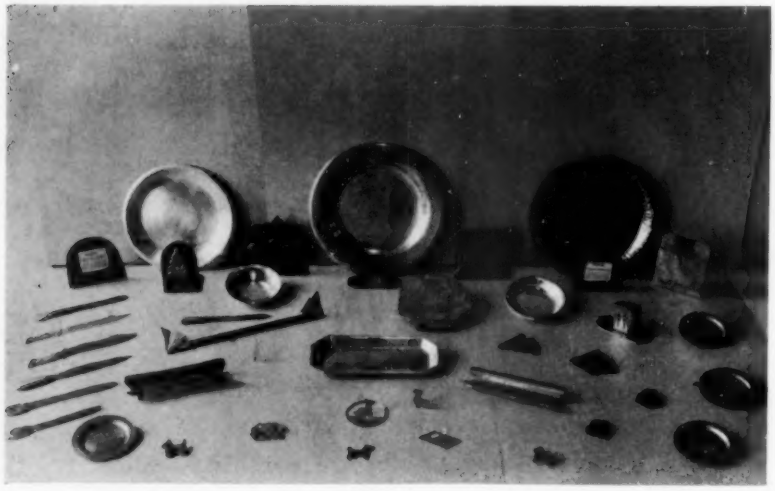
ONE must acknowledge that the worth-while outcomes of a high school education can be attained only with suitable physical equipment. However, the presence of a good school plant does not insure a good school. To be sure, the average American community demands a school building of architectural beauty that is fire-resistant and equipped with the perfected heating, lighting, ventilating and plumbing systems essential to community health. Moreover, there must be provisions for making the school a social center in the community. It is well, however, for both laymen and teachers to be continually aware that all this does not establish an educational program, a school in fact. A school must be a place in which the youth are developed to meet the problems of adult life, and therefore the training must anticipate future conditions. It is a matter of common observation that we are living in an age of fast-changing social, economic and industrial conditions.

Training for Life Interests

The life-interest appeal seems to be the logical approach to the problem of getting high school students interested in their school work. There is a decided trend to submerge the so-called college preparatory curriculums under the broader objective of vocational direction. The strictly college preparatory curriculums have in the past carried undue social prestige, while curriculums offering vocational preparation in other directions have been ignored or offered to those social misfits whose possibility of success is very meager. That the high school should assume responsibility for college preparation is desirable and necessary. That the high school should give one group a preferred place over another is undemocratic in spirit and practice.

The Chadsey High School, newest of Detroit's fifteen high schools, offers the following curriculums: (1) general, (2) college preparatory, (3) commercial, (4) technical, (5) home economics. The present building represents a first unit with a rated capacity of 1,250 pupils. It contains an auditorium capable of seating 1,200. There are the usual provisions for science laboratories. This first unit includes three large shops, one electrical, one metal and one comprehensive general shop. There are two drafting rooms. Four laboratories are devoted to home economics.

The counselors help pupils to make a program of studies which will give vocational direction to their life interest. Even with the college preparatory group vocational direction is made the dominating motive—not an imaginary curriculum prestige. Those boys and girls who aspire to be

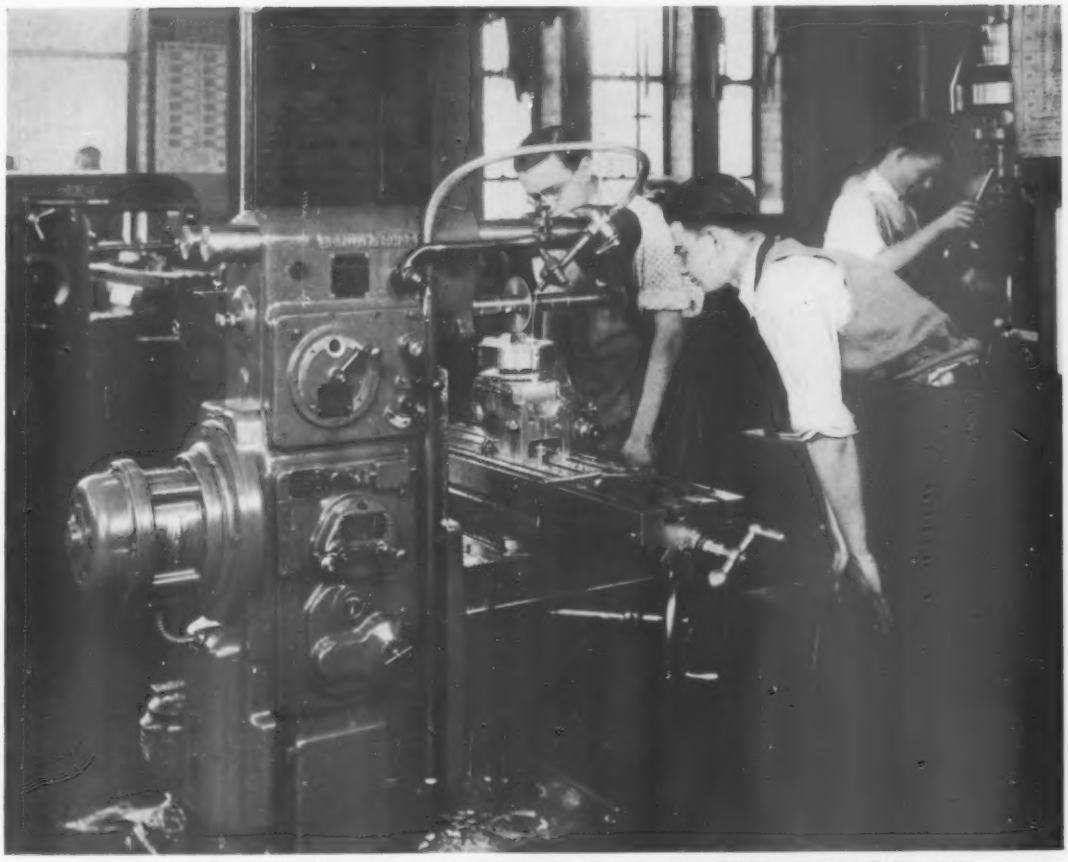


STUDENTS IN THE CHADSEY HAVE THE OPPORTUNITY TO WORK WITH BRASS, COPPER, PEWTER, AND ALUMINUM

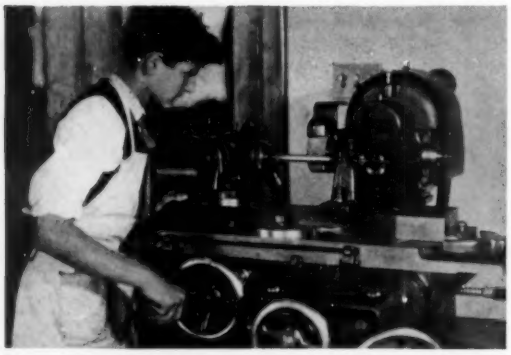
VOCATIONAL EDUCATION DRAFTING ROOM IN THE HIGH SCHOOL

FORGING AND HEAT-TREATMENT OF METALS IS AN IMPORTANT PART OF ALL METAL INDUSTRIES

METAL SHAPER IN THE METAL SHOP OF CHADSEY



ON THE MILLING MACHINE TWO AND SOMETIMES THREE BOYS WORK AT THE SAME TIME
The boy who is oldest in point of service instructs the newcomer



GRINDING INTRODUCES PRECISION MEASUREMENTS TO VERY CLOSE LIMITS

doctors, lawyers, dentists, engineers or clergymen are made familiar with the high school program of studies which will admit them to the universities and colleges where that kind of professional training is available. Because Chadsey is a new school, the graduates have not yet reported on the practicability of their high school education.

Technical arts education is available in Chadsey to any boy. The tools, machines and many of the "learnings" are the same for trade education as for general education. Therefore, many boys, irrespective of their plans for a life vocation, take shop work. As the instruction in the shops is highly individualized, these boys who are not taking the work primarily for trade preparation find it easy to modify their own program of shop work. It is significant that almost every boy in Chadsey tries to get a term or more of shop work.

Shop programs are offered in the technical curriculum. The shop facilities, one metal shop, one general shop, one electrical shop and one drafting room, permit the following shop subjects to be taken in a pre-arranged sequence. The students spend about 135 minutes daily in shop and drawing.

I. *Program of Shop Subjects in Preparation for the Metal Working Industries*

10B—Metal fitting and drawing
10A—Machine shop practice and drawing
11B—Pattern making and drawing
11A—Machine shop (2)
12B—Machine shop (3)
12A—Pattern making or machine shop or electrical construction or drafting

II. *Program of Shop Subjects in Preparation for the Electrical Industries*

10B—Metal fitting
10A—Electrical construction (1)
11B—Electrical construction (2)
11A—Machine shop (1)
12B—Electrical construction (3)
12A—Drafting or electrical construction

As shop facilities permit, additional shop programs are being set up in pattern making, refrigeration, auto mechanics and drafting.

Preparation to Meet Changes

High school programs in the field of vocational education are a precarious field of educational planning. Employment conditions are continually changing. The economic conditions may throw large numbers out of employment in one line of industrial activity. New mechanical inventions such as radio, refrigeration, and the internal combustion engine will create a sudden demand for large numbers of workers trained in an entirely new set of skills. Gas and electric welding is an illustration. Even old and established trades such as blacksmith, steam fitter and machinist must master skills never before required. The changes in the past ten years have been almost revolutionary. It is logical to expect this rate of change to continue.

Technological changes are only one of the factors which force changes in educational procedures. The attitude towards juvenile employment has changed until the trend is toward an industrial order in which there are no workers under twenty years of age, even as learners and apprentices. The almost doubled enrolment in our high schools during the past few years proves that the public schools must provide the preliminary training of youth for entrance in industry. Therefore, trade and industrial training must become an integral part of any well-rounded-out system of high school education.

Since it is likely that technological changes will continue to be an important problem in industry, it would seem that all the schools of today can hope to do for a large majority of the young learners is to lay a foundation within broad areas. For example, to teach machine shop practice within the limits of the engine lathe, shaper, milling machine and drill presumes that the machinist trade is a definite set of processes, operations and skills. This condition does not exist. New metals have been introduced; cutting tools to operate at speeds never before considered have been developed; metals are being pressed, welded, die-cast, machined and ground by methods and to limits heretofore never dreamed of.

The best service the school can render the young learner is to try to introduce him to as many of the new materials, new ways of doing things, as possible. There are basic processes and operations, there are materials, which will likely remain in general use and common to many metal trades and manufacturing processes. The Chadsey High School is using its three shops, its drawing room, its physical laboratories, for this purpose. At the completion of their high school course, or at any time during the course where opportunity offers, boys are assisted in entering industry as apprentices or learners. It seems that specific trade training should be coincident with or directly preceding employment.

GENERAL ELECTRIC COMPANY

General Office: Schenectady, New York

SALES OFFICES IN PRINCIPAL CITIES

ELECTRIC LABORATORY APPARATUS AND EDUCATIONAL SERVICE

for

COLLEGES AND TECHNICAL SCHOOLS

Motors
Generators
Switchboards
Converters

Control Panels
Relay Demonstration Panels
Transformers
Electrical Measuring Instruments

Recognizing the fact that the future welfare of industry, and of this country, depends upon how well the students of today are trained for the work of tomorrow, the General Electric Company endeavors to aid the faculty and students of our schools and colleges in every way possible. To this end, publications, technical information, motion picture films, illustrated lectures, etc., are made generally available without charge. Further than this, liberal discounts are allowed to educational institutions.

For use in school laboratories General Electric Company has given special attention to the design and manufacture of various machines and devices that embody the characteristics of the corresponding commercial types, but in smaller sizes and ratings, at less expense.

General Electric engineers will be glad to recommend apparatus to meet your special conditions if you will give them details such as the type of course, number of students, laboratory or shop space available, etc.

Available on Request

Bulletin GEA-1185B, illustrating and describing G-E apparatus particularly adapted to school and college laboratories

Instruction booklets on shop projects, as follows:

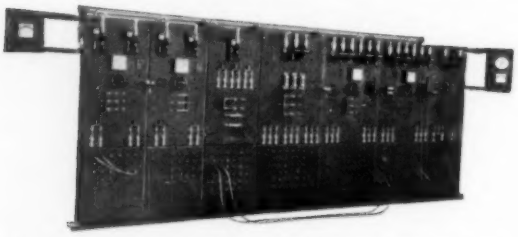
1. Bulletin GES-909: Construction Data for a ¼-hp. Single Phase Induction Motor
2. Bulletin GEA-2138: Construction Data for a ¾-hp. Three-Phase Induction Motor
3. Bulletin GEA-2140: Construction Data for a ½ hp. Single Phase Induction Motor
4. Bulletin GEA-2289: Construction Data for a 250 Watt 125 V. d-c Generator
5. Bulletin GET-569: Construction Data for a Transformer Rated Natural Draft, 60 Cycles, 1½ kv-a; Primary Volts, 220; Secondary Volts, 55/110

(Kits for these projects can be purchased from General Electric Company.)

AHI Synchronous Generator, 6 pole—5 KVA (4 KW., .8 pf)—110/220 V., 1, 3 or 6 phase—1200 r.p.m.

Motion pictures and illustrated lectures, loaned without charge (except cost of transportation) to schools, colleges and engineering societies. All film subjects obtainable in either the 35-mm. or 16-mm. standard widths, except those with synchronized sound, which are in 35 mm. film only.

The following **equipment for use in motion picture presentation** is furnished by General Electric Company: transformers, circuit breakers, wire and cable, wiring devices, panel boards and switchboards, meters and instruments, fuses, switches, relays, resistors, rectifiers, motor-generator sets, battery-charging equipment,



Electrical Laboratory Main Distribution Switchboard

motors and control, floodlights, searchlights, arc lamps, mercury-vapor lamps, lamps for photography and projection, stage and theater lighting, thyratron-reactor dimming control, master-control boards; selsyns for remote control of spotlights, floodlights, shutters and color screens; sign-lighting equipment; sequence-circuit control dimmers, photoelectric relays for lighting control, air-conditioning equipment, ticket booth machines, etc.

See Booklet GES-402 for lists of motion pictures, silent films and illustrated lectures furnished by General Electric Company. Subjects include: Street Lighting, Floodlighting, A Brief History of the Electrical Industry, Charles P. Steinmetz, Within the Gates of General Electric, Thomas A. Edison, History of Floodlighting, History of the General Electric Company, The All-Electric Ship, The Vacuum Tube in a Wider Field, Heat, Magnetism, Mechanics, and Sound.

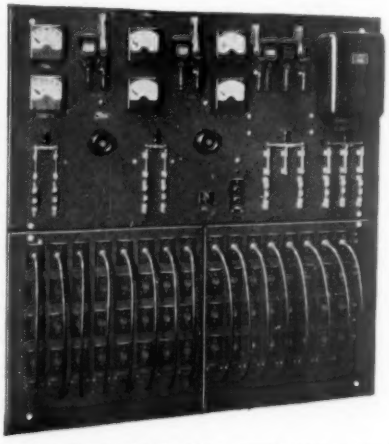
The AHI Alternating-Current Generator and Motor

The Type AHI alternating-current generator here illustrated has long been the standard for teaching the fundamentals of alternating currents. Its flexibility permits its use in a very wide variety of laboratory experiments. It is now manufactured in two ratings which conform closely to standard commercial machines, but modifications make it ideal as a demonstrating unit for school use. The Type AHI machine is designed to run as an alternator or synchronous motor. Extra rotors are available which, when substituted in place of the salient pole rotor, convert the machine into a squirrel-cage induction motor, a phase-wound-rotor induction motor or frequency converter.

General Electric Company manufactures standard motor-generators in a wide variety of types and ratings, for both alternating and direct current.

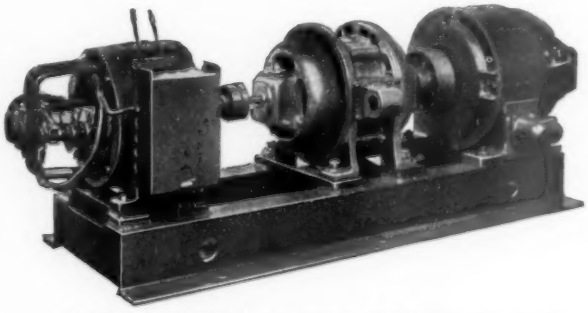
Switchboards for Laboratory Service

General Electric has developed a switchboard to meet the needs of the average technical school laboratory which provides maximum flexibility. This board provides for parallel operation of a-c and d-c generators, under standard conditions, and it supplies the laboratory with a very effective and variable feeder system. A complete switchboard is shown at left, consisting of seven double-section panels and two swinging brackets. Each panel is a complete unit and the board may be purchased piecemeal, thus gradually building up the main board as it is needed.



Science Laboratory Distribution Panel, 125 V. and 16 V. d-c—115 V. and 230 V. a-c

Standard Control Apparatus to protect students from accidental contact from live switches; **Dynamometers,** for accurate measurement of power or torque; **Transformers; Synchronous Converters; Sine-Wave Generators; G-E Steam Tur-**



Science Laboratory d-c Motor Generator Set—Induction motor drive—generates 125 V. d-c and 16 V. d-c

bines; Air Circuit Breakers, for protection of laboratory apparatus from abnormal current conditions; **High-Voltage Testing Equipment;** and **Generator Voltage Regulators,** are among the other types of school laboratory equipment described and illustrated in **Booklet GEA-1185.**

ELECTRICAL MEASURING INSTRUMENTS

No apparatus in the college laboratory is of more importance than the electrical measuring instruments. A well-equipped laboratory will need an assortment of standard instruments of all types and capacities, since there is hardly an experiment performed by the students which does not require their use. When selecting such instruments, too much care cannot be given to accuracy, permanence of calibration, dead-beat indications, and legibility of scales. In the design and construction of G-E electrical measuring instruments, careful consideration is given to all of these details.

Portable Wattmeter, Type P-3

Portable Wattmeter, Type P-3

Type P-3 portable instruments as illustrated have been designed for high accuracy under extraordinary conditions of service. They comprise a full line of ammeters, voltmeters, single-phase and polyphase wattmeters, frequency meters, power-factor meters, and single-phase wattmeters for low-power-factor measurements — each covering the usual ranges of current, voltage, frequency, etc. The accuracy is 0.2% of full scale value. The size is 5⅝ x 8⅝ x 8¼ inches.

Oscillograph, Type PM-12

Portable Oscillograph, Type PM-12

The PM-12 is a compact portable two-element oscillograph for visual inspection or for photographic recording of wave shapes. The size is 18½ x 10 x 9 inches. A calibrating screen is provided so that current and voltage values can be obtained quickly and easily. It is self-contained and operates from a commercial lighting source.

Portable a-c Voltmeter, Type AP-9

Portable a-c Voltmeter, Type AP-9

The AP-9 is a medium-size portable a-c instrument for measurements of current, voltage or watts. Its size is only 2 7/16 x 6 9/16 x 4 13/16, and the scale length 4.1 inches. The accuracy is 0.75% of full scale value. A molded textolite case with hinged cover completely protects the glass and binding posts when not in use. This instrument has been designed and built for long dependable service under severe conditions.

Other electrical measuring instruments for college laboratory use which are described and illustrated in Booklet GEA-1185B (approximately 60 pages) are portable voltmeters, portable timing devices, synchronism indicators, power-factor meters, strip-chart recording instruments, watt-hour meters, and permanent-magnet and cathode-ray oscillographs.

Heavy Current Impulses Thyratron Tube FG-139

Mercury pool cathode tubes with igniter control have the ability to pass very heavy rectified half-cycles of alternating current for a fraction of a cycle or for several cycles. A number of sizes of such tubes are available, the largest with a peak current rating of 5000 amperes.

Thyratron Tube —FG 139

Further information will be gladly furnished by the Educational Specialist at the nearest office of the General Electric Company or Schenectady, New York.

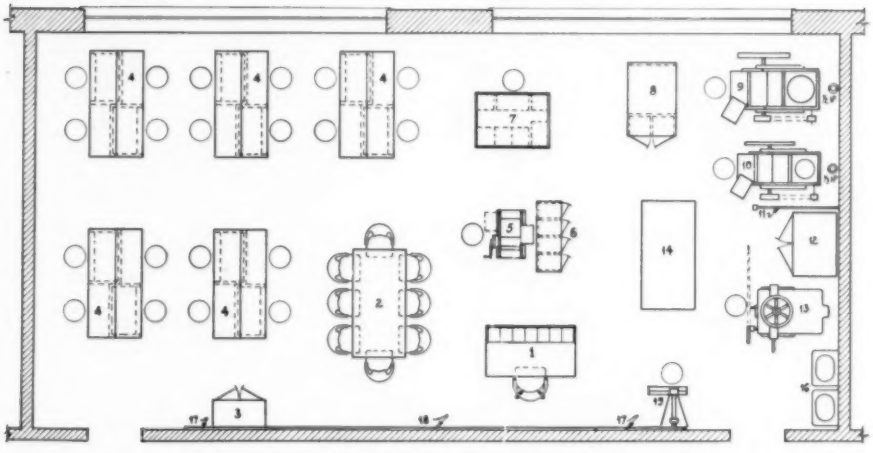
AMERICAN TYPE FOUNDERS

DEPARTMENT OF EDUCATION

ELIZABETH, NEW JERSEY

Perfection Senior High School Printing Unit

ACCOMMODATES 20 TO 25 STUDENTS



KEY TO FLOOR PLAN

1—Instructor's Desk
2—Study and Reference Table
3—Bookcase
4—No. 870 American School Type Cabinet
5—No. 1 Vandercook Proof Press
6—No. 13535 American School Galley Cabinet
7—No. 13983 American School Imposing Table
8—No. 9095 American School Pressroom Cabinet
9—12x18 C. & P. Press
10—10x15 C. & P. Press
11—Guard Rail
12—Paper Storage Cabinet
13—Lever Paper Cutter
14—Bindery Table
15—Boston Wire Stitcher
16—Lavatories
17—Cork Exhibit Board
18—Blackboard
◎—Power Intake
○—Position of Student

A Perfection Printing Unit.—*The equipment recommended herewith is especially designed for use in the Senior High School classes. This unit is complete in every detail and includes only equipment of the highest quality of materials and construction. Pupils working with Perfection equipment form habits of efficiency and accuracy and enjoy the largest measure of self-respect and satisfaction in their school work.*

MACHINERY

1 **8x12 New Series C. & P. Platen Press,** complete with 3 rollers
2 prs. Roller Supporters
1 Model D Redington Counter
1 C. & P. Platen Guard
1 C. & P. Press Brake
1 New Series Short Fountain
1 Motor Bracket with belt-tightening adjustment including pulley
1 Kimble ¼ h. p. Motor, variable speed, with pedestal speed control, belt drive for local current
1 Endless Leather Belt
1 Wire Mesh Belt Guard
1 Drip Pan, galvanized iron, 4x5 feet, beaded edge

1 **12x18 New Series C. & P. Platen Press,** complete with 3 rollers
2 prs. Roller Supporters
1 Model D Redington Counter
1 C. & P. Fibre Flywheel Guard
1 C. & P. Platen Guard
1 C. & P. Press Brake
1 C. & P. Long Fountain
1 Motor Bracket with belt-tightening adjustment including pulley
1 Kimble ½ h. p. Motor, variable speed, with pedestal speed control, belt drive, for local current
1 Endless Leather Belt
1 Wire Mesh Belt Guard
1 Drip Pan, galvanized iron, 4x5 feet, beaded edge

1 **26½-inch Hand Lever Paper Cutter, C. & P. Craftsman or Challenge Advance,** including 2 knives, measuring tape and 4 cutting sticks, and equipped with two-handed safety control
1 **Vandercook Proof Press**
1 **No. 5 Boston Wire Stitcher,** foot power

TYPES USED: MEMBERS OF THE CENTURY SCHOOLBOOK FAMILY, BERNHARD GOTHIC FAMILY, WITH RALEIGH CURSIVE

AMERICAN TYPE FOUNDERS

EVERYTHING FOR THE SCHOOL PRINTSHOP

FURNITURE

5 No. 870 American Perfection School Type Cabinets, steel construction, with cases

1 No. 13983 American School Imposing Table, steel construction, including reglet and furniture

1 No. 13535 American School Galley Cabinet, steel construction, with capacity for 100 galleys

1 No. 529 American School Pressroom Cabinet, steel construction

1 No. 15038 Bindery Table, size 36x72 inches

1 No. 15050 Padding Attachment

1 No. 15047 Stock Forwarding Table

2 No. 3045 Quarter Size Rule Cases

1 No. 3185 Leader Box

MISCELLANEOUS

20 Rouse Pica Composing Sticks, 6x2, stainless steel

1 Rouse Job Composing Stick, 10x2, stainless steel

1 Rouse Job Composing Stick, 15x2, stainless steel

100 Pressed Steel Galleys, 8¾x13 inches

2 All Brass Job Galleys, 8¾x13 inches

1 All Brass Job Galley, 12x18 inches

1 Success Benzine Can, quart size

1 Justrite Benzine Storage Can, gallon size

1 Stapleset Benzine Brush No. 1, oval back

1 No. 5805 Hickory Mallet

1 No. 5839 Type Planer, 3¼x6 inches

1 No. 5835 Proof Planer, 3½x8 inches, with leather top

1 doz. Challenge Quoins No. 1

1 Challenge Quoin Key No. 1

1 doz. Megill Spring Tongue Gauge Pins

1 doz. Megill No. 2 Original Steel Gauge Pins

1 Boston Model No. 1 Typographic Numbering Machine, 5 wheels

1 Line Gauge, Rouse No. 2, pica and nonpareil, 12 inch

1 Oily Waste Can, McNutt No. 3

1 lb. Amtyco Printing Ink in ¼ lb. tubes, assorted colors

10 lbs. No. 25 Bookbinders' Wire on 2 steel spools

1 ball Page Cord

1 set of "Visual Aids for Instruction in Printing," 24 charts 11-x14 inches

1 copy "The Practice of Printing," by Polk

1 copy "Student's History of Printing," by Haines

1 No. 1 Universal Cylinder Bellows

1 No. 604 Style B Square End Ink Knife

1 No. 30 American Lead and Rule Cutter

1 quart Make-Ready Paste

1 quart Tabbing Compound

TYPE AND SPACING MATERIALS

Schoolbook Oldstyle

1 font 6 point
40 lbs. 8 point
200 lbs. 10 point
30 lbs. 12 point
15 lbs. 14 point
20 lbs. 18 point
2 fonts 24 point
1 font 30 point
1 font 36 point

Century Schoolbook Italic

1 font 6 point
1 font 8 point
1 font 10 point
1 font 12 point
1 font 14 point
1 font 18 point
1 font 24 point

Century Schoolbook Bold

1 font 6 point
1 font 8 point
1 font 10 point
1 font 12 point
1 font 14 point
1 font 18 point
1 font 24 point
1 font 30 point
1 font 36 point
1 font 48 point

HEAVY COPPERPLATE GOTHIC

1 font 6 point No. 21
1 font 6 point No. 22
1 font 6 point No. 23
1 font 6 point No. 24
1 font 12 point No. 25
1 font 12 point No. 26
1 font 12 point No. 27
1 font 12 point No. 28
1 font 12 point No. 29
1 font 12 point No. 30

Wedding Text

1 font 8 point
1 font 10 point
1 font 12 point
1 font 14 point
1 font 18 point
1 font 24 point

Spaces and Quads

5 lbs. 6 point
15 lbs. 8 point
60 lbs. 10 point
20 lbs. 12 point
10 lbs. 14 point
10 lbs. 18 point
10 lbs. 24 point
5 lbs. 30 point
5 lbs. 36 point
1 font 48 point

5 fonts No. 9011D 2 point Leads, 5 to 9½ picas

5 fonts No. 9011E 6 point Slugs, 5 to 9½ picas

10 fonts No. 9011F 2 point Leads, 10 to 40 picas

10 fonts No. 9011G 6 point Slugs, 10 to 50 picas

5 lbs. No. 1002
2 point L. S. Brass Rule

5 lbs. No. 2082
2 point L. S. Brass Rule

1 font No. 1002
2 point Miters for Rule

1 font No. 2082
2 point Miters for Rule

25 lbs. Metal Furniture, L. S. font

5 lbs. American Line Leaders, 10 point, Series 546, 4 dots to the em

1 lb. 10 point Braces and Dashes

1 lb. 10 point Fractions

½ lb. 10 point Reference Marks

1 font Series 21 Parentheses and Brackets

1 No. 20 Assortment Thin Spaces with Quarter Size Case

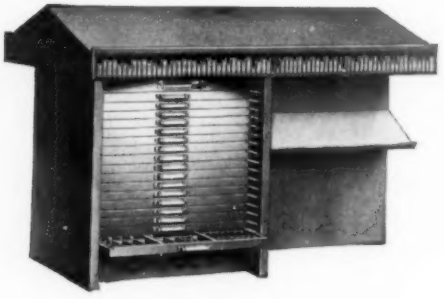
AMERICAN TYPE FOUNDERS

EVERYTHING FOR THE SCHOOL PRINTSHOP

Every Type of Cabinet for the School Printshop

Combination Pressroom Cabinet and Stock Table

This cabinet is specially designed to save space by combining a drying rack with a stock table, ink and roller compartments, a bin for the storage of rags, and drawers for tools. The twelve drying frames may be pulled from either side of the cabinet, so that freshly printed sheets can be placed in the dryer from one side and removed from the opposite side.



No. 870

Perfection School Type Cabinet

For Senior High School Classes

Two pupils working at each side have between them a complete equipment of type, spacing materials and galley dump. There is no superstructure to obscure the instructor's view of his students.

No. 12008 Type Cabinet

Showing Case Side

Recommended for Trade Classes

The picture shows how liberal supplies of spacing materials are brought into the alleys in plain sight for instant use—also in plain sight of the instructor, so that he cannot fail to see that the compositors are provided with sufficient spacing and justifying materials.

No. 9190

American Ideal School Type Cabinet

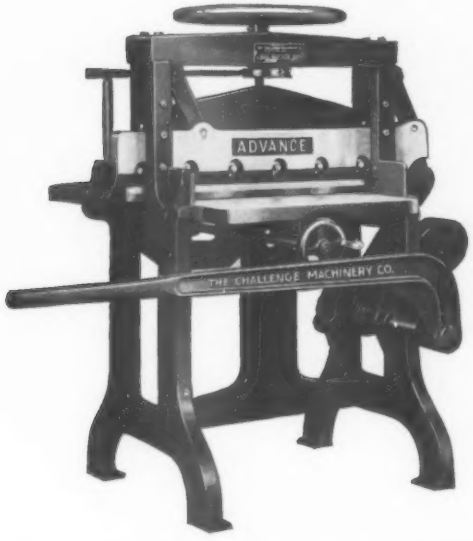
For Junior High School Pupils

Cabinet contains one No. 2701 blank case, thirteen No. 2735 California job cases and two No. 2765 Wells two-font cases, all full size. The double working-bank top accommodates two pupils at a time in setting type.

AMERICAN TYPE FOUNDERS

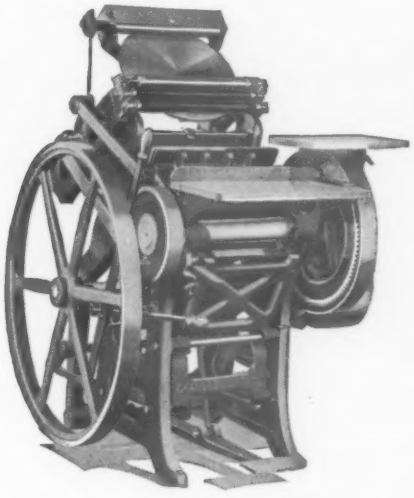
EVERYTHING FOR THE SCHOOL PRINTSHOP

Printshop Machinery



Advance Lever Paper Cutter

The "Old Reliable"—in the lead for over thirty years. Four sizes: 19, 26½, 30 and 36 inches.



Chandler & Price New Series Press

Standard Equipment: Single Disc, Throw-off, Depressible Grippers, 3 Semi-Steel Chases, 6 Roller Stocks, 6 Roller Trucks, 2 Wrenches, Crankshaft and Combined Gear and Pinion Guard.

Chase sizes: 8x12, 10x15 and 12x18 inches.

No. 1 Vandercook Proof Press

Ideal for all hand-inking work within its size—accurate, rigid, accessible.

Printing surface, 14x18 inches.

Boston Wire Stitcher No. 5

Capacity, 2 sheets to ½ inch; 4 cutting surfaces; singly adjusted to thickness of work by using hand lever.

DELTA MANUFACTURING CO.

600-634 E. Vienna Avenue
(Dept. AS-136), Milwaukee, Wis.

"DELTA" QUALITY TOOLS

Standard for School Shops

School shops all over the country are rapidly adopting Delta tools as standard equipment. These sturdy, efficient, motor-driven tools are saving time, money and labor for their users in industry. Delta tools are built to stand heavy strain of continuous production work. They are being used by some of the largest manufacturers in the country because of their accuracy, quality construction and flexibility. Yet their initial cost is so low that they are well within the reach of the most modest school budget.

You will be astonished at the advance skillful design to be found in all Delta quality motor-driven tools

Write for latest Delta catalog and name of your nearest Delta dealer today

NEW SHAPER UNIT

The New Shaper Unit here illustrated is one of the simplest and at the same time most complete Shapers ever designed for the workshop. Some of its important basic features are:

1. Extra large table permitting the handling of large work with ease;
2. Interchangeable spindles for 5/16" and 1/2" hole cutters for various types of work;
3. Improved completely adjustable fence for all varieties of straight work; starting pin for curved work of all kinds;
4. Complete guarding system;
5. High speed of 10,000 r.p.m. which with standard 3-lip Delta cutter gives over 30,000 cuts a minute, thus insuring smooth and finished work;
6. Complete range of cabinet and sash cutters for all types of mill work.

For full details and description of this unusual tool together with illustrations of large variety of work that can be done with it, send for the new 1936 Delta catalog.

NEW "DELTA" LINE OF ADVANCED GRINDERS

Not just another line of grinders—but revolutionary **new** grinders in every sense of the word! Belt-driven, motor-driven and pedestal models—they all embody Delta's high standards of designs and construction. No pains have been spared to make these new Delta Tools **ideal** in every way—convenient, safe, accurate and efficient—truly, here are the grinders that shopworkers have always wanted—and at the unusually moderate Delta price levels.

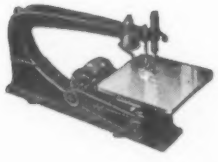
NEW PEDESTAL MODEL

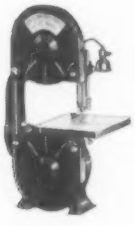
WRITE FOR 1936 CATALOG

The 1936 book, "Practical Delta Projects"—Book Two of the project series—is crowded with new and out-of-the-ordinary things to make. Thirty-two pages, with numerous working drawings, photographs of operations and setups, and practical illustrations of short cuts and hints that will be of value to every shop teacher. Simple, complete instructions make every project easy to follow. Uniform in style with the 1935 book, every shop teacher should have a copy. Send only 10 cents. Booklet and 1936 catalog will then be mailed to you promptly.

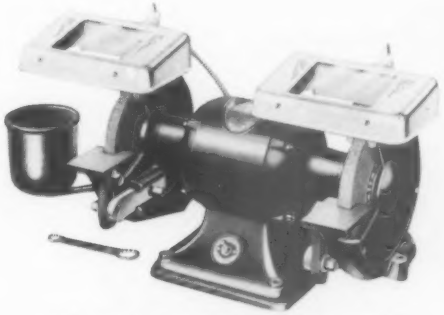
WRITE FOR NEW 1936 DELTA CATALOG

The Delta line includes circular saws, jointers, lathes, scroll saws, band saws, routers, shapers, grinders and a complete assortment of attachments and accessories.





If proof of Delta superiority were necessary for the craftsman who knows good tools, it would be afforded by the fact that the Delta Manufacturing Company is now the largest manufacturer in the world making this type of machinery exclusively.

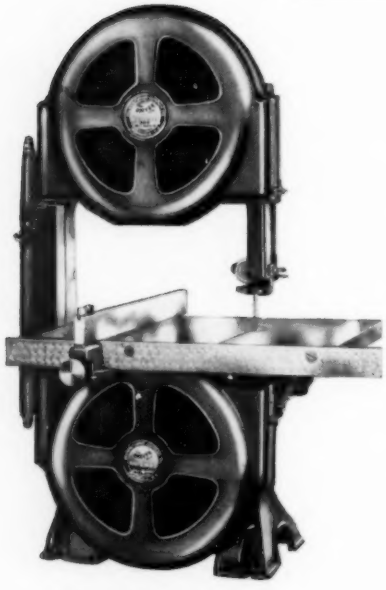


NEW DELTA MOTOR-DRIVEN BENCH MODEL GRINDER

WALKER-TURNER CO., INC.

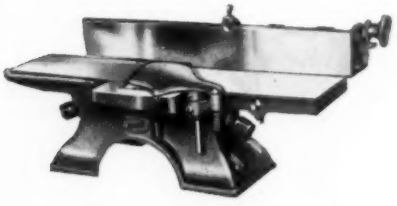
639 South Ave. Plainfield, New Jersey

"DRIVER" bench type woodworking tools are ideal for the school shop. They embody modern design, finest materials and proven dependability. Yet they are priced so low that practically every budget can carry them. Whether your program involves an immediate investment in power tools or not, write for new catalog and see the outstanding features these remarkable tools provide.



12″ BAND SAW

Six SKF ball bearings assure accurate work, indefinitely. Wheels are carefully balanced. Frame is cast iron, tubular type. Table size 12½″ x 12″. Distance upper guide to table 6″. Extra quality characterizes every feature.



4″ BALL-BEARING JOINTER

This jointer has a three-knife solid steel head turning on SKF ball bearings. High speed steel knives. Length overall 28″. Both tables adjustable. Guard dropped down for rabbeting.

10″ BENCH SAW

Maximum cutting capacity 3″. Spindle ¾″ diameter between bearings. Worm gear tilts table, another raises and lowers arbor. Table size 21″ x 15″ (31″ x 21″ available).

Send for 40-Page Descriptive Catalog

WOOD OR METAL WORKING LATHE

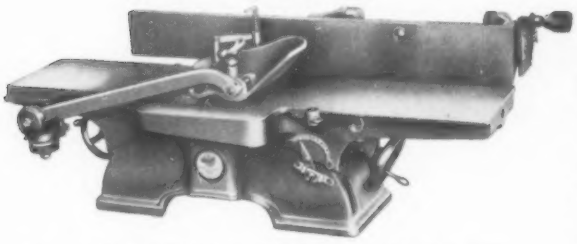
Metal spinning attachments and a compound slide rest are available for this heavy woodturning lathe. Bed is 54″ long, heavy cast iron. Distance between centers 37″. Swing at gap 13½″. SKF ball bearings.

THE AMERICAN SCHOOL AND UNIVERSITY

WALKER-TURNER CO., INC.

639 South Ave. Plainfield, New Jersey

NEW 6" JOINTER



A powerful, precision 6" jointer—with features which will at once be recognized as unique . . . and superior. Even the casual observer will notice how finely every factor of correct jointer design has been worked out by DRIVER engineers —and with what thoroughness every step of manufacture has been covered in producing this superb machine.

NEW DUAL-PURPOSE GUARD

On ordinary jointers the guard simply swings over the knives for protection. But the guard on this jointer has been so designed that the work can be fed under it while the operator's left hand, resting on the guard applies the necessary amount of pressure. This permits planing wood down to ribbon thickness, with absolute safety. Fingers can never get near the knives. Also, thin narrow strips may be planed down to practically nothing by feeding the strip between the fence and the curved, inner edge of the guard.

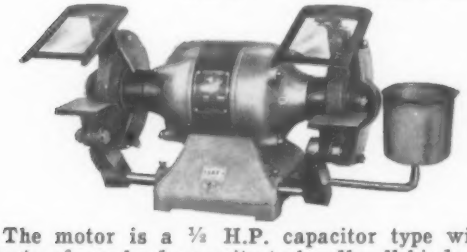
The belt guard completely covers the belt affording full protection. A slot in the guard provides sufficient movement for belt adjustment.

At the right is shown the jointer mounted on an all-steel bench, with sawdust chute. This combination makes an ideal outfit.

Features

Length over all 37½".
Length of tables (rear 15½", front 17½").
Width of front table at rabbeting ledge 10½".
Width of tables (normal) 7¾".
Cutterhead solid steel, 2½" diameter.
3 high speed steel knives.
SKF Ball Bearings.
Tables slide on dovetail ways, with adjustable gibbs.
Tables heavy cored castings, carefully ground.
Fence cast iron, 28" long, 4" high.
Fence has sturdy, positive geared tilting device.
Guard drops down out of way for rabbeting.
Protractor depth gauge accurately indicates position of front table.
Rabbeting capacity up to ⅝" cut.
Operating speed 4000-4500 R.P.M.
Motor required ⅓ H. P. to ½ H. P.
Shipping weight 160 lbs. (Jointer only.)

NEW 7" MOTOR GRINDER ½ H. P., 3450 R.P.M.



The motor is a ½ H.P. capacitor type with plenty of overload capacity to handle all kinds of heavy work, in constant use. It has no centrifugal starting switch. Instead it has a high-grade condenser mounted in the base. The condenser is permanently connected in circuit for both starting and running. Operating speed is 3450 R.P.M. Motor efficiency is very high, which results in low current consumption. It is equipped with large grease-sealed SKF Ball Bearings, the motor and bearings being fully protected from dirt and dust.

Wheels are 7" in diameter, 1" wide, carefully balanced. Guards provide full protection, their design being in accordance with latest safety code requirements. Non-shatterable glass shields and cooling cup are regular equipment. Shafts ⅝" in diameter.

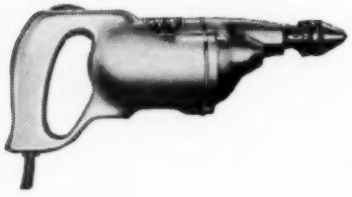
The motor end bells are extended to give plenty of room between the wheels and motor body so that the work may be more conveniently handled. Wheel guards and tool rests are fully adjustable. A high-grade snap switch is mounted in the base.

THE BLACK & DECKER MFG. CO.

Towson, Maryland

BLACK & DECKER

¼" JUNIOR ELECTRIC DRILL



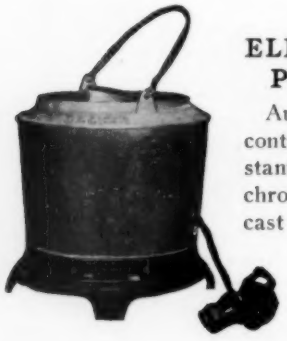
A "handy" drill at a sensationally low price. Equipped with "Compo" oilless bearings and Jacobs chuck.

No-load speed	1800 R.P.M.
Net weight	4½ lbs.
Price	$19.50

½" JUNIOR ELECTRIC DRILL

A popular ½" Drill in the low price range. Fitted with "Compo" oilless bearings for smooth operation, Jacobs chuck, sturdy aluminum housing for better balance.

No-load speed	375 R.P.M.
Net weight	10½ lbs.
Price	$35.00



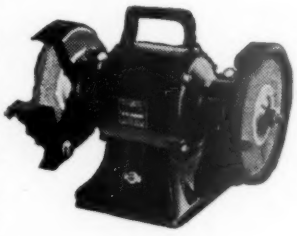
ELECTRIC GLUE POT

Automatic thermostat control maintains a constant temperature. Nichrome heating element, cast aluminum glue pot.

Price complete, $17.00

6" SPECIAL BENCH GRINDER

Quality materials and workmanship, combined with low cost, make this Bench Grinder a practical unit to spot at convenient points in the shop. Fitted with "Compo" oilless bearings.



Net weight	38 lbs.
Price, all voltages, single phase, 50-60 cy. A.C.	$24.00

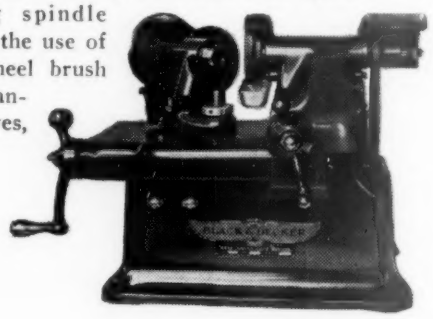
PORTABLE ELECTRIC SANDERS

To meet the varying requirements of the different applications for which these Sanders are designed and to increase the range of their usefulness, the Black & Decker Sander line now has the following sizes:

7" Light Duty ...	$48.00	7" Super Service .	$85.00
7" Heavy Duty ..	75.00	9" Standard	88.00

SUPER SERVICE VALVE REFACER

Two independent, Universal motors insure absolute accuracy. The feed screw combines screw-feed accuracy and lever-feed speed. The grinding spindle permits the use of wire wheel brush for cleaning valves, etc.



9/16" Refacer, $120.00

BROWN & SHARPE MFG. CO.

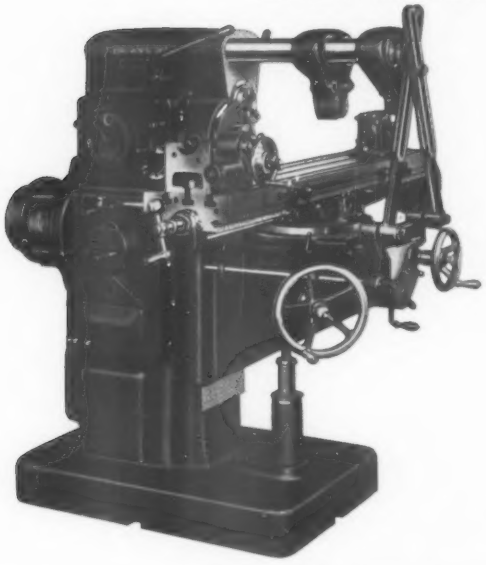
Established 1833

Providence, R. I.

Catalog on Request

"World's Standard B·S *of Accuracy"*

BROWN & SHARPE MACHINE TOOLS



MILLING MACHINES
GRINDING MACHINES
GEAR CUTTING MACHINES
GEAR HOBBING MACHINES
SCREW MACHINES

Investigate the No. 2 Light Type Universal Milling Machine (shown here)—an ideal machine for the school shop.

—convenient height
—easily operated
—individual Motor Drive

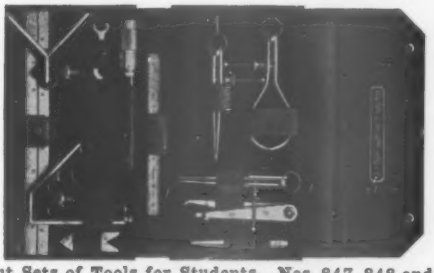
Write for detailed specifications

BROWN & SHARPE MACHINISTS' TOOLS AND CUTTERS

MICROMETERS
CALIPERS
VERNIERS
GAGES
INDICATORS

MILLING CUTTERS
END MILLS
FACE MILLS
SLITTING SAWS
GEAR CUTTERS
HOBS

ARBORS and COLLETS
GROUND FLAT STOCK
SURFACE PLATES
VISES and PUMPS



Ask about Sets of Tools for Students—Nos. 847, 848 and 849—desirable selections every shop student should own

THE AMERICAN SCHOOL AND UNIVERSITY

WICKES BROTHERS

Manufacturers of
Continuous Electric Blueprinting Machines
SAGINAW, MICH.
Established 1856

PRODUCTS

Wickes Continuous Electric Blueprinting Machines, Heavy-Duty Plate Working Tools, Heavy-Duty Engine Lathes, Special Production Lathes, Crankshaft Turning Equipment, Gang Saws.

WICKES BLUEPRINTING MACHINES

Operation. — The Wickes continuous electric blueprinting machine will print separately cut sheets or continuous rolls in any length and in widths from 2 to 48 inches. It is entirely automatic, the only work required of the operator being the placing of tracing and paper on the traveling belt which carries them to the feed roller around the printing cylinder, in which is mounted the lighting element. The printed paper is then delivered to a light-tight storage compartment and the tracing returned to operator or to the storage compartment as desired.

WICKES CONTINUOUS ELECTRIC BLUEPRINTING MACHINE

Printing Cylinder.—The printing cylinder is composed of spirally disposed wires woven from either side to center, mounted stationary in machine, offering practically no obstruction to light as is the case with glass cylinder, the paper and tracing passing over 92 per cent of the circumference of the cylinder.

FOUR-STEP QUICK-CHANGE GEAR BOX

Advantages of Wickes Continuous Electric Blueprint Machine.—Operator not required to work in darkened room.

Operation of machine so simple that any inexperienced operator can make perfect prints.

Operator can start, stop, reverse, increase and decrease speed of machine without changing his position.

The variable-speed, four-step, quick-change gear box allows belt speed adjustment to suit any grade of paper including Vandycks.

Power consumption of motor and lamps reduced to a minimum. Manufactured in one size with floor space 2 ft. 6 in. x 5 ft. x 30 in. high, and two models readily interchangeable. Lighting elements are mercury vapor lamps of standard pattern, each lamp controlled separately.

Machines shipped on 30 days' free trial to approved credit risks.

Catalogs sent upon request fully describing our machines.

Section X

COLLEGE, UNIVERSITY AND NORMAL SCHOOL PRESIDENTS

In the United States and Canada for the 1935-1936 College Year

(Normal school principals are designated by an asterisk.)

City	Institution	President
Alabama		
Athens	Athens College for Young Women	E. R. Naylor
Auburn	Alabama Polytechnic Institute	L. N. Duncan
Birmingham	Birmingham-Southern College	Guy E. Snavely
Birmingham	Howard College	T. V. Neal
Birmingham	Miles Memorial College	Brooks Dickens
Daphne	State Normal School	D. R. Murphey
Florence	State Teachers College	H. J. Willingham
Jacksonville	State Teachers College	C. W. Daugette
Livingston	State Teachers College	G. W. Brock
Marion	Judson College	L. G. Cleverdon
Montevallo	Alabama College	A. F. Harman
Montgomery	State Teachers College	H. C. Trenholm
Montgomery	Huntingdon College	Walter D. Agnew
Normal	State Agricultural & Mechanical Institute	J. F. Drake
Selma	Selma University	Wm. H. Dinkins
Spring Hill	Spring Hill College	John J. Druhan
Talladega	Talladega College	Buell G. Gallagher
Troy	State Teachers College	E. M. Shackelford
Tuskegee	Tuskegee Normal and Industrial Institute	F. D. Patterson
University	University of Alabama	George H. Denny
Arizona		
Flagstaff	Arizona State Teachers College	Thomas J. Tormey
Tempe	Arizona State Teachers College	Grady Gammage
Tucson	University of Arizona	H. LeRoy Shantz
Arkansas		
Arkadelphia	Henderson State Teachers College	J. P. Womack
Arkadelphia	Ouachita College	James R. Grant
Batesville	Arkansas College	W. S. Lacy
Clarksville	The College of the Ozarks	Wiley Lin Hurie
Conway	Arkansas State Teachers College	H. L. McAlister
Conway	Hendrix College	J. H. Reynolds
Fayetteville	University of Arkansas	John C. Futrall
Jonesboro	Arkansas State College	V. C. Kays
Little Rock	Arkansas Baptist College	R. C. Woods
Little Rock	Little Rock College	John J. Healy
North Little Rock	Shorter College	T. M. Greene
Pine Bluff	Agricultural, Mechanical and Normal College	John B. Watson
Searcy	Harding College	J. N. Armstrong
Siloam Springs	John Brown University	John E. Brown
California		
Angwin	Pacific Union College	Walter I. Smith
Arcata	Humboldt State Teachers College	Arthur S. Gist
Berkeley	Pacific School of Religion	H. F. Swartz
Berkeley	University of California	Robert G. Sproul
Chico	State Teachers College	A. J. Hamilton
Claremont	Claremont Colleges	James A. Blaisdell
Claremont	Pomona College	C. K. Edmunds
Claremont	Scripps College	Ernest J. Jaqua
Fresno	State Teachers College	F. W. Thomas
La Verne	La Verne College	Ellis M. Studebaker
Los Angeles	Chapman College	Cecil F. Cheverton
Los Angeles	College of Medical Evangelists	Percy T. Magan
Los Angeles	College of Osteopathic Physicians and Surgeons	Carle H. Phinney
Los Angeles	Loyola University at Los Angeles	Hugh M. Duce
Los Angeles	Occidental College	Remsen D. Bird
Los Angeles	University of California at Los Angeles	R. G. Sproul
Los Angeles	University of Southern California	R. B. von KleinSmid
Oakland	College of the Holy Names	Mother Mary Redempta
Oakland	Mills College	A. H. Reinhardt
Pasadena	California Institute of Technology	Robert A. Millikan, Ch. Exec. Council
Pasadena	Pasadena College	H. Orton Wiley
Redlands	University of Redlands	Clarence Howe Thurber
St. Mary's College	St. Mary's College	Brother Albert
San Diego	San Diego State College	Walter R. Hepner
San Francisco	San Francisco College for Women	Mother M. Guerin
San Francisco	State Teachers College	Alex. C. Roberts
San Francisco	University of San Francisco	Harold E. Ring
San Jose	State Teachers College	T. W. MacQuarrie
San Rafael	Dominican College	Sister Mary Thomas
Santa Barbara	State College	Clarence L. Phelps
Santa Clara	University of Santa Clara	Louis C. Rudolph
Stanford Univ.	Stanford University	Ray Lyman Wilbur
Stockton	College of the Pacific	Tully C. Knoles
Whittier	Whittier College	W. O. Mendenhall
Colorado		
Alamosa	Adams State Teachers College	Ira Richardson
Boulder	University of Colorado	George Norlin
Colorado Springs	Colorado College	Thurston J. Davies
Denver	Regis College	R. M. Kelley
Denver	University of Denver	D. Shaw Duncan
Fort Collins	Colorado State College of Agriculture and Mechanic Arts	Charles A. Lory
Golden	Colorado School of Mines	M. F. Coolbaugh
Greeley	Colorado State College of Education	G. W. Frasier
Gunnison	Western State College	C. C. Casey
Loretto	Loretto Heights College	Mother Ann Francis
Connecticut		
Danbury	State Normal School	Ralph C. Jenkins*
Hartford	Hartford Theological Seminary	Rockwell H. Potter Dean
Hartford	Trinity College	Remsen B. Ogilby
Middletown	Wesleyan University	J. L. McConaughy
New Britain	The Teachers College of Connecticut	Herbert D. Welte*
New Haven	Albertus Magnus College	Sister M. Anacletus
New Haven	Arnold College for Hygiene and Physical Education	Webster Stover
New Haven	Connecticut College of Pharmacy	Curtis P. Gladding
New Haven	State Normal School	F. E. Engleman*
New Haven	Yale University	James R. Angell
New London	Connecticut College	Katharine Blunt
New London	United States Coast Guard Academy	E. D. Jones, Supt.
Storrs	Connecticut State College	Albert N. Jorgensen
Willimantic	State Normal School	George H. Shafer*
Delaware		
Dover	State College for Colored Students	R. S. Grossley
Newark	University of Delaware	Walter Hullihen
District of Columbia		
Washington	The American University	Joseph M. M. Gray, Chancellor
Washington	Catholic University of America	James H. Ryan, Rector
Washington	Gallaudet College	Percival Hall
Washington	Georgetown University	Arthur A. O'Leary
Washington	George Washington University	Cloyd Heck Marvin
Washington	Howard University	M. W. Johnson
Washington	National University	Hayden Johnson, Chancellor
Washington	Trinity College	Sister Berchmans Julia
Washington	J. O. Wilson Teachers College	Edgar C. Higbie
Florida		
Coral Gables	University of Miami	B. F. Ashe
Daytona Beach	Bethune-Cookman College	Mary McLeod Bethune
Deland	John B. Stetson University	Wm. Sims Allen
Gainesville	University of Florida	John J. Tigert
Lakeland	Florida Southern College	Ludd M. Spivey
Tallahassee	Florida Agricultural & Mechanical College for Negroes	J. R. E. Lee
Tallahassee	Florida State College for Women	Edward Conradi
Tampa	University of Tampa	Frederick H. Spaulding
Winter Park	Rollins College	Hamilton Holt

City	Institution	President
Georgia		
Albany	Georgia Normal and Agricultural College	J. W. Holley
Americus	Georgia Southwestern College	Peyton Jacob
Athens	University of Georgia	Harmon White Caldwell
Atlanta	Atlanta-Southern Dental College	S. W. Foster
Atlanta	Atlanta University	John Hope
Atlanta	Clark University	M. S. Davage
Atlanta	Georgia School of Technology	Marion L. Brittain
Atlanta	Morehouse College	S. H. Archer
Atlanta	Morris Brown College	W. A. Fountain, Jr.
Atlanta	Spelman College	Florence M. Read
Augusta	Paine College	E. C. Peters
Bowdon	Bowdon College	Eldon Dittemore
Collegeboro	South Georgia Teachers College	M. S. Pittman
Decatur	Agnes Scott College	James R. McCain
Demorest	Piedmont College	Henry C. Newell
Emory University	Emory University	Harvey W. Cox
Forsyth	Bessie Tift College	Aquila Chamlee
Gainesville	Brenau College	H. J. Pearce
La Grange	La Grange College	W. E. Thompson
Macon	Mercer University	Spright Dowell
Macon	Weslevan College	Dice R. Anderson
Milledgeville	Georgia State College for Women	Guy H. Wells
Mount Berry	Berry College	Martha Berry
Oglethorpe University	Oglethorpe University	Thornwell Jacobs
Rome	Shorter College	Paul M. Cousins
Savannah	Georgia State Industrial College	B. F. Hubert
Valdosta	Georgia State Woman's College	Frank R. Reade
Idaho		
Albion	Albion State Normal School	R. H. Snyder
Caldwell	The College of Idaho	Wm. Judson Boone
Gooding	Gooding College	George A. Odgers
Lewiston	Lewiston State Normal School	J. E. Turner
Moscow	University of Idaho	M. G. Neale
Nampa	Northwest Nazarene College	Russell V. DeLong
Illinois		
Alton	Shurtleff College	P. L. Thompson
Aurora	Aurora College	Theodore Pierson Stephens
Bloomington	Illinois Wesleyan University	Harry Wright McPherson
Bourbonnais	St. Viator College	E. V. Cardinal
Carbondale	Southern Illinois State Normal University	Roscoe Pulliam
Carthage	Carthage College	Rudolph G. Schuls
Charleston	Eastern Illinois State Teachers College	Robert G. Buzzard
Chicago	Armour Institute of Technology	Willard E. Hotchkiss
Chicago	Central Y. M. C. A. College	T. H. Nelson
Chicago	Chicago College of Osteopathy	Harry L. Collins
Chicago	Chicago Normal College	Butler Laughlin
Chicago	De Paul University	Michael J. O'Connell
Chicago	Lewis Institute	D. C. Jackson, Jr.
Chicago	Loyola University	Samuel K. Wilson
Chicago	Mundelein College for Women	Sister M. Justitia
Chicago	Pestalozzi Froebel Teachers College	Bertha H. Hegner
Chicago	St. Francis Xavier College for Women	Mother M. Sophia Mitchell
Chicago	The Chicago Theo. Seminary	Albert W. Palmer
Chicago	The University of Chicago	Robert M. Hutchins
Decatur	James Millikin University	John C. Hessler
De Kalb	Northern Illinois State Teachers College	Karl L. Adams
Elmhurst	Elmhurst College	Timothy Lehmann
Eureka	Eureka College	Clyde L. Lyon
Evanston	National College of Education	Edna Dean Baker
Evanston	Northwestern University	Walter Dill Scott
Galesburg	Knox College	Albert Britt
Greenville	Greenville College	Leslie R. Marston
Jacksonville	Illinois College	Harold C. Jaquith
Jacksonville	MacMurray College	C. P. McClelland
Joliet	College of St. Francis	Mother M. Thomasine
Lake Forest	Lake Forest College	H. McComb Moore
Lebanon	McKendree College	C. R. Yost
Lisle	St. Procopius College	Valentine Kohlbeck
Macomb	Western Illinois State Teachers College	W. P. Morgan
Monmouth	Monmouth College	Thos. H. McMichael
Naperville	North Central College	Edward E. Rall
Normal	Illinois State Normal University	R. W. Fairchild
Peoria	Bradley Polytechnic Institute	F. R. Hamilton
Peru	St. Bede College	Justus Wirth
Quincy	Quincy College	V. A. Fochtman
River Forest	Rosary College	Sister Thomas Aquinas
Rockford	Rockford College	Gordon Keith Chalmers
Rock Island	Augustana College and Theological Seminary	Conrad Bergendoff
Urbana	University of Illinois	A. C. Willard
Wheaton	Wheaton College	J. O. Buswell, Jr.
Indiana		
Bloomington	Indiana University	William L. Bryan
Crawfordsville	Wabash College	Louis B. Hopkins
Danville	Central Normal College	Waldo E. Wood
Evansville	Evansville College	Earl E. Harper
Franklin	Franklin College	Wm. Gear Spencer
Goshen	Goshen College	Sanford C. Yoder
Greencastle	DePauw University	G. Bromley Oxnam
Hanover	Hanover College	A. G. Parker, Jr.
Huntington	Huntington College	Harold C. Mason
Indianapolis	Butler University	James William Putnam
Indianapolis	Indiana Central College	I. J. Good
Indianapolis	Indianapolis College of Pharmacy	Edward H. Niles
Indianapolis	Normal College of the American Gymnastic Union	Carl B. Sputh
Lafayette	Purdue University	Edward C. Elliott
Marion	Marion College	Wm. F. McConn
Muncie	Ball State Teachers College	L. A. Pittenger
N. Manchester	Manchester College	Otho Winger
Notre Dame	St. Mary's College	Sister M. Madeleva
Notre Dame	University of Notre Dame	John F. O'Hara
Oakland City	Oakland City College	W. P. Dearing
Richmond	Earlham College	William C. Dennis
St. Mary of the Woods	St. Mary of the Woods College	Mother Mary Raphael
Terre Haute	Indiana State Teachers College	Ralph N. Tirey
Terre Haute	Rose Polytechnic Institute	Donald B. Prentice
Upland	Taylor University	Robert Lee Stuart
Valparaiso	Valparaiso University	O. C. Kreinheder
Iowa		
Ames	Iowa State College of Agriculture and Mechanic Arts	R. M. Hughes
Cedar Falls	Iowa State Teachers College	O. R. Latham
Cedar Rapids	Coe College	Harry M. Gage
Davenport	St. Ambrose College	Martin Cone
Decorah	Luther College	O. J. H. Preus
Des Moines	Des Moines College of Pharmacy	Carl Weeks
Des Moines	Des Moines Still College of Osteopathy	A. O. Becker
D s Moines	Drake University	D. W. Morehouse
Dubuque	Clarke College	Sister Mary Agatha
Dubuque	Columbia College	Thomas Conry
Dubuque	University of Dubuque	W. B. Zukor, Vice President
Fairfield	Parsons College	Clarence W. Greene
Fayette	Upper Iowa University	Arthur E. Bennett
Grinnell	Grinnell College	John S. Nollen
Indianola	Simpson College	John L. Hillman
Iowa City	State University of Iowa	Eugene A Gilmore
Le Mars	Western Union College	D. O. Kime
Mount Pleasant	Iowa Wesleyan College	Harry D. Henry
Mount Vernon	Cornell College	H. J. Burgstahler
Oskaloosa	William Penn College	H. Randolph Pyle
Pella	Central College	Irwin J. Lubbers
Sioux City	Morningside College	Robert E. O'Brian
Sioux City	Trinity College	John A. Elbert
Storm Lake	Buena Vista College	Henry Olson
University Park	Fletcher College	John Paul
Kansas		
Atchison	Mt. St. Scholastica College	Mother Lucy Dooley
Atchison	St. Benedict's College	Martin Veth
Baldwin City	Baker University	Wallace B. Fleming
Bethel College	Bethel College	Ed. G. Kaufman
Emporia	College of Emporia	John Bailey Kelly
Emporia	Kansas State Teachers College	Thomas W. Butcher
Hays	Fort Hays Kansas State College	C. E. Rarick
Lawrence	University of Kansas	E. H. Lindley
Lindsborg	Bethany College	Ernst F. Pihlblad
McPherson	McPherson College	V. F. Schwalm
Manhattan	Kansas State College of Agriculture and Applied Science	Francis D. Farrell
Ottawa	Ottawa University	W. P. Behan, Acting
Pittsburg	Kansas State Teachers College	W. A. Brandenburg
St. Marys	St. Mary's College	M. Germing
Salina	Kansas Wesleyan University	Larkin B. Bowers
Salina	Marymount College	Mother Rose Waller
Sterling	Sterling College	H. A. Kelsey
Topeka	Washburn College	Philip C. King
Wichita	Friends University	David M. Edwards
Wichita	Municipal University of Wichita	William M. Jardine
Winfield	Southwestern College	Frank E. Mossman

City	Institution	President
Kentucky		
Barbourville	Union College	John Owen Gross
Berea	Berea College	Wm. J. Hutchins
Bowling Green	Western Kentucky State Teachers College	H. H. Cherry
Danville	Centre College	Charles J. Turck
Frankfort	Kentucky State Industrial College	R. B. Atwood
Georgetown	Georgetown College	Henry Noble Sherwood
Lexington	Transylvania College	Arthur Braden
Lexington	University of Kentucky	Frank L. McVey
Louisville	Louisville College of Pharmacy	Fred P. Kranz
Louisville	Louisville Municipal College	Raymond A. Kent
Louisville	Nazareth College	Mother M. Catherine Malone
Louisville	Southern Baptist Theological Seminary	John R. Sampey
Louisville	University of Louisville	Raymond A. Kent
Morehead	Morehead State Teachers College	J. Howard Payne
Murray	State Teachers College	James H. Richmond
Richmond	Eastern Kentucky State Teachers College	H. L. Donovan
Wilmore	Asbury College	H. C. Morrison
Winchester	Kentucky Wesleyan College	R. V. Bennett
Louisiana		
Baton Rouge	Louisiana State University and Agricultural & Mechanical College	James M. Smith
Lafayette	Southwestern Louisiana Institute	Edwin L. Stephens
Natchitoches	Louisiana State Normal College	A. A. Fredericks
New Orleans	Dillard University	W. W. Alexander
New Orleans	Loyola University	John W. Hynes
New Orleans	Newcomb Memorial College	Pierce Butler
New Orleans	St. Mary Dominican College	Mother Mary Catherine
New Orleans	Tulane University of Louisiana	A. B. Dinwiddie
New Orleans	Ursuline College	Mother Mary Rose McKinney
New Orleans	Xavier University	Mother M. Agatha
Pineville	Louisiana College	Claybrook Cottingham
Ruston	Louisiana Polytechnic Institute	G. W. Bond
Scotlandville	Southern University	J. S. Clark
Shreveport	Centenary College of Louisiana	Pierce Cline
Maine		
Brunswick	Bowdoin College	Kenneth C. M. Sills
Castine	Eastern State Normal School	William D. Hall
Farmington	State Normal School	Wilbert G. Mallett
Fort Kent	Madawaska Training School	Richard F. Crocker*
Gorham	State Normal School	Walter E. Russell
Lewiston	Bates College	Clifton D. Gray
Machias	Washington State Normal School	Philip H. Kimball*
Orono	University of Maine	Arthur A. Hauck
Presque Isle	Aroostock State Normal School	San L. Merriman
Waterville	Colby College	Franklin W. Johnson
Maryland		
Annapolis	St. John's College	A. W. W. Woodcock
Annapolis	United States Naval Academy	David F. Sellers, Supt.
Baltimore	Goucher College	David A. Robertson
Baltimore	Johns Hopkins University	Isaiah Bowman
Baltimore	Lovola College	J. A. Canning
Baltimore	Milton University	Wm. Jas. Heaps
Baltimore	Morgan College	John O. Spencer
Baltimore	College of Notre Dame of Maryland	Sister M. Frances
Baltimore	St. Mary's Seminary & University	John F. Fenlon
Bowie	Maryland Normal School	L. S. James
Chestertown	Washington College	Gilbert W. Mead
College Park	University of Maryland	H. C. Byrd, Acting
Emmitsburg	Mount St. Mary's College	Bernard J. Bradley
Emmitsburg	St. Joseph's College	Sister Paula
Frederick	Hood College	Henry I. Stahr
Frostburg	State Teachers College	John L. Dunkle*
Lutherville	Maryland College for Women	Frederick E. Metzger
Salisbury	Maryland State Teachers College	J. D. Blackwell
Tacoma Park	Washington Missionary College	Harvey A. Morrison
Towson	State Teachers College	Lida Lee Tall
Westminster	Western Maryland College	F. G. Holloway
Massachusetts		
Amherst	Amherst College	Stanley King
Amherst	Massachusetts State College	Hugh P. Baker
Boston	Boston University	Daniel L. Marsh
Boston	Emmanuel College	Sister Agnes Cecilia
Boston	Massachusetts College of Pharmacy	Theodore J. Bradley
Boston	Northeastern University	Frank P. Speare
Boston	Simmons College	Bancroft Beatley
Boston	Teachers College of the City of Boston	Wm. H. J. Kennedy
Bridgewater	State Teachers College	Zenos E. Scott
Cambridge	Harvard University	James B. Conant
Cambridge	Massachusetts Institute of Technology	Karl T. Compton
Cambridge	Radcliffe College	Ada L. Comstock
Chestnut Hill	Boston College	L. J. Gallagher
Fitchburg	State Teachers College	Charles M. Herlihy
Framingham	State Teachers College	Francis A. Bagnall
Hyannis	State Teachers College	Herbert H. Howes
Lowell	Lowell Textile Institute	Charles H. Eames
Lowell	State Teachers College	James Dugan
Newton Center	Andover Newton Theological School	Everett C. Herrick
North Adams	State Teachers College	Albert G. Eldridge
Northampton	Smith College	William A. Neilson
Norton	Wheaton College	John Edgar Park
Salem	State Teachers College	J. Asbury Pitman
South Hadley	Mount Holyoke College	Mary E. Woolley
South Lancaster	Atlantic Union College	O. M. John
Springfield	American International College	C. S. McGown
Springfield	International Y. M. C. A. College	L. L. Doggett
Tufts College	Tufts College	John A. Cousens
Wellesley	Wellesley College	Ellen F. Pendleton
Westfield	State Teachers College	Charles Russell
Williamstown	Williams College	Tyler Dennett
Worcester	Clark University	Wallace W. Atwood
Worcester	Holy Cross College	Francis J. Dolan
Worcester	State Teachers College	Wm. B. Aspinwall
Worcester	Worcester Polytechnic Institute	Ralph Earle
Michigan		
Adrian	Adrian College	Harlan L. Feeman
Albion	Albion College	John L. Seaton
Alma	Alma College	Harry M. Crooks
Ann Arbor	University of Michigan	Alex. G. Ruthven
Battle Creek	Battle Creek College	Emil Leffler
Berrien Springs	Emmanuel Missionary College	Thomas W. Steen
Detroit	Detroit College of Law	Charles B. Van Duesen
Detroit	Detroit Institute of Technology	Paul Hickey
Detroit	Marygrove College	George H. Derry
Detroit	Sacred Heart Seminary	Daniel J. Ryan
Detroit	University of Detroit	A. H. Poetker
Detroit	Wayne University	Frank Cody
East Lansing	Michigan State College of Agriculture and Applied Science	Robert S. Shaw
Grand Rapids	Calvin College	Ralph Stob
Hillsdale	Hillsdale College of Michigan	Willfred Mauck
Holland	Hope College	Wynand Wichers
Houghton	Michigan College of Mining and Technology	Grover C. Dillman
Kalamazoo	Kalamazoo College	Charles T. Goodsell
Kalamazoo	Western State Teachers College	D. B. Waldo
Marquette	Northern State Teachers College	Webster H. Pearce
Mt. Pleasant	Central State Teachers College	E. C. Warriner
Nazareth	Nazareth College	Mother M. Agatha
Olivet	Olivet College	Joseph Brewer
Ypsilanti	Michigan State Normal College	J. M. Munson
Minnesota		
Bemidji	State Teachers College	M. W. Deputy
Collegeville	St. John's University	Alcuin Deutsch
Duluth	College of St. Scholastica	Mother M. Agnes Somers
Duluth	State Teachers College	E. W. Bohannon
Mankato	State Teachers College	Frank D. McElroy
Minneapolis	Augsburg Seminary	George Sverdrup
Minneapolis	University of Minnesota	Lotus D. Coffman
Moorhead	Concordia College	J. N. Brown
Moorhead	State Teachers College	R. B. MacLean
New Ulm	Dr. Martin Luther College	E. R. Bliefernicht
Northfield	Carleton College	Donald J. Cowling
Northfield	St. Olaf College	L. W. Boe
St. Cloud	State Teachers College	George A. Selke
St. Joseph	College of St. Benedict	Sister Rosamond Pratscher
St. Paul	Bethel Institute	G. A. Hagstrom
St. Paul	College of St. Catherine	Sister Antonia
St. Paul	College of St. Thomas	James H. Moynihan
St. Paul	Hamline University	Charles N. Pace
St. Paul	Macalester College	John C. Acheson
St. Peter	Gustavus Adolphus College	O. J. Johnson
Winona	College of St. Teresa	Sister Mary A. Molloy
Winona	St. Mary's College	Brother Leopold
Winona	State Teachers College	Guy E. Maxwell
Mississippi		
Alcorn	Agricultural & Mechanical College	Wm. H. Bell
Blue Mountain	Blue Mountain College	Lawrence T. Lowrey
Cleveland	Delta State Teachers College	W. M. Kethley
Clinton	Mississippi College	D. M. Nelson
Columbus	Mississippi State College for Women	B. L. Parkinson
Hattiesburg	Mississippi Woman's College	W. E. Holcomb
Hattiesburg	State Teachers College	J. B. George
Holly Springs	Rust College	L. M. McCoy

City	Institution	President
Mississippi—Cont.		
Jackson	Belhaven College	G. T. Gillespie
Jackson	Jackson College	B. Baldwin Dansby
Jackson	Millsaps College	D. M. Key
State College	Mississippi State College	G. D. Humphrey
Tougaloo	Tougaloo College	Judson L. Cross
University	University of Mississippi	A. B. Butts
Missouri		
Canton	Culver Stockton College	John H. Wood
Cape Girardeau	Southeast Missouri State Teachers College	Walter W. Parker
Columbia	University of Missouri	F. A. Middlebush
Fayette	Central College	Robert H. Ruff
Fulton	Westminster College	F. L. McCluer
Jefferson City	Lincoln University	C. W. Florence
Kansas City	Kansas City College of Osteopathy & Surgery	Geo. J. Conley
Kansas City	Kansas City-Western Dental College	R. J. Rinehart, Dean
Kansas City	Rockhurst College	Daniel H. Conway
Kansas City	Teachers College of Kansas City	G. W. Diemer
Kirksville	Kirksville College of Osteopathy & Surgery	Geo. M. Laughlin
Kirksville	Northeast Missouri State Teachers College	Eugene Fair
Liberty	William Jewell College	John F. Herget
Marshall	Missouri Valley College	George H. Mack
Maryville	Northwest Missouri State Teachers College	Uel W. Lamkin
Parkville	Park College	F. W. Hawley
St. Charles	Lindenwood College	John L. Roemer
St. Louis	Concordia Theological Seminary	L. Fuerbringer
St. Louis	Harris Teachers College	C. G. Vannest
St. Louis	Maryville College	Mother Mary Reid
St. Louis	St. Louis College of Pharmacy	H. E. Klostermann
St. Louis	St. Louis University	Robert S. Johnston
St. Louis	Stowe Teachers College	Ruth M. Harris
St. Louis	Washington University	George R. Throop
Springfield	Drury College	T. W. Nadal
Springfield	Southwest Missouri State Teachers College	Roy Ellis
Tarkio	Tarkio College	M. E. Collins
Warrensburg	Central Missouri State Teachers College	E. L. Hendricks
Webster Groves	Webster College	George F. Donovan
Montana		
Billings	Eastern Montana Normal School, University of Montana	L. B. McMullen
Bozeman	Montana State College of Agriculture & Mechanic Arts	Alfred Atkinson
Butte	Montana School of Mines	Francis A. Thomson
Dillon	Montana State Normal College	Sheldon E. Davis
Helena	Carroll College	Emmet Riley
Helena	Intermountain Union College	Jesse W. Bunch
Missoula	State University of Montana	F. C. Scheuch
Polytechnic	Billings Polytechnic Institute	Ernest T. Eaton
Nebraska		
Blair	Dana College	Erland Nelson
Central City	Nebraska Central College	O. W. Carrell
Chadron	Nebraska State Normal College	Robert I. Elliott
Crete	Doane College	Edwin B. Dean
Fremont	Midland College	H. F. Martin
Hastings	Hastings College	J. W. Creighton
Kearney	Nebraska State Teachers College	George E. Martin
Lincoln	Nebraska Wesleyan University	E. Guy Cutshall
Lincoln	Union College	M. L. Andreasen
Lincoln	University of Nebraska	E. A. Burnett, Chancellor
Omaha	Creighton University	Patrick J. Mahan
Omaha	Municipal University of Omaha	Rowland Haynes
Peru	Peru State Teachers College	W. R. Pate
Seward	Concordia Teachers College	C. F. Brommer
Wayne	Nebraska State Teachers College	J. T. Anderson
York	York College	J. R. Overmiller
Nevada		
Reno	University of Nevada	Walter E. Clark
New Hampshire		
Durham	University of New Hampshire	Edward M. Lewis
Hanover	Dartmouth College	Ernest M. Hopkins
Keene	Keene Normal School	Wallace E. Mason
Manchester	St. Anselm's College	Bertrand C. Dolan
Plymouth	Plymouth Normal School	Ernest L. Silver
New Jersey		
Convent Station	College of St. Elizabeth	Sister Marie Jose Byrne, Dean
East Orange	Panzer College of Physical Education and Hygiene	Margaret C. Brown
East Orange	Upsala College	Carl G. Erickson
Glassboro	New Jersey State College	J. J. Savitz
Hoboken	Stevens Institute of Technology	Harvey N. Davis
Jersey City	St. Peter's College	Joseph S. Dinneen
Jersey City	State Normal School at Jersey City	Roy L. Shaffer
Madison	Drew University	Arlo Ayres Brown
Montclair	New Jersey State Teachers College	Harry A. Sprague
Newark	Newark College of Engineering	Allan R. Cullimore
Newark	New Jersey State Teachers College	M. Ernest Townsend
Newark	University of Newark	Frank Kingdon
New Brunswick	New Jersey State College for Women	Margaret T. Corwin, Dean
New Brunswick	Rutgers University	Robert C. Clothier
Paterson	New Jersey State Normal School	Robert H. Morrison
Princeton	Princeton Theological Seminary	James Ross Stevenson
Princeton	Princeton University	Harold W. Dodds
Princeton	St. Joseph's College	Anthony Kieffer
South Orange	Seton Hall College	Frank J. Monaghan
Trenton	State Teachers College	Roscoe L. West
New Mexico		
Albuquerque	University of New Mexico	J. F. Zimmerman
El Rito	Spanish-American Normal School	Joseph B. Grant
Las Vegas	New Mexico Normal University	H. C. Gossard
Silver City	New Mexico State Teachers College	Hoyt C. Graham
Socorro	New Mexico School of Mines	E. H. Wells
State College	New Mexico College of Agriculture & Mechanic Arts	H. L. Kent
New York		
Albany	College of St. Rose	Edmund F. Gibbons
Albany	State College for Teachers	A. R. Brubacher
Alfred	Alfred University	J. Nelson Norwood
Annandale-on-Hudson	Bard College, Columbia University	Donald G. Tewksbury, Act. Dean
Auburn	Auburn Theological Seminary	Harry Lathrop Reed
Aurora	Wells College	Kerr D. Macmillan
Brockport	State Normal School	Alfred C. Thompson
Bronxville	Sarah Lawrence College	Constance Warren
Brooklyn	Brooklyn College	William A. Boylan
Brooklyn	Long Island University	Tristram W. Metcalfe, Dean
Brooklyn	Polytechnic Institute of Brooklyn	Harry S. Rogers
Brooklyn	Saint Francis College	Brother Capistran
Brooklyn	St. John's University	Edward J. Walsh
Brooklyn	St. Joseph's College for Women	Thomas E. Molloy
Buffalo	Canisius College	James P. Sweeney
Buffalo	D'Youville College	Sister Grace of the Sacred Heart
Buffalo	State Teachers College	Harry W. Rockwell
Buffalo	The University of Buffalo	Samuel Paul Capen
Canton	St. Lawrence University	Laurens H. Seelye
Clinton	Hamilton College	Frederick C. Ferry
Cortland	State Normal School	H. DeW. DeGroat*
Elmira	Elmira College	W. S. A. Pott
Fredonia	State Normal School	L. R. Gregory*
Garden City	Adelphi College	Frank D. Blodgett
Geneseo	State Normal School	James B. Welles
Geneva	Hobart College	Murray Bartlett
Hamilton	Colgate University	George B. Cutten
Houghton	Houghton College	James S. Luckey
Ithaca	Cornell University	Livingston Farrand
Ithaca	Ithaca College	Leonard Bliss Job
Keuka Park	Keuka College	J. Hillis Miller
New Paltz	State Normal School	L. H. van den Berg
New Rochelle	College of New Rochelle	Cornelius Crowley
New York	Barnard College	Virginia C. Gildersleeve, Dean
New York	Biblical Seminary in New York	Wilbert W. White
New York	College of the City of New York	F. B. Robinson
New York	College of Mount St. Vincent	Sister Josephine Rosaire, Dean
New York	College of The Sacred Heart	Mother Grace C. Dammann
New York	Columbia University	Nicholas M. Butler
New York	Cooper Union	Gano Dunn
New York	Fordham University	Aloysius J. Hogan
New York	General Theological Seminary	H. Fosbroke, Dean
New York	Hunter College of the City of N.Y.	Eugene A. Colligan
New York	Jewish Theological Seminary of America	Cyrus Adler
New York	Manhattan College	Brother Patrick
New York	New York Homeopathic Medical College	Claude A. Burrett, Dean
New York	New York University	Harry W. Chase, Chancellor
New York	Savage School for Physical Education	Ella W. Savage
New York	Teachers College, Columbia University	Wm. F. Russell, Dean
New York	Union Theological Seminary	Henry S. Coffin
Niagara Univ	Niagara University	Joseph M. Noonan

City	Institution	President
New York—Cont.		
Oneonta	Hartwick College	Chas. W. Leitzell
Oneonta	State Normal School	Chas. W. Hunt*
Oswego	State Normal School	Ralph W. Swetman*
Plattsburg	State Normal School	Charles C. Ward
Potsdam	Clarkson College of Technology	James Shelby Thomas
Potsdam	State Normal School	R. T. Congdon*
Poughkeepsie	Vassar College	H. N. MacCracken
Rochester	Nazareth College	Sister M. Sylvester
Rochester	The Colgate-Rochester Divinity School	Albert W. Beaven
Rochester	University of Rochester	Alan Valentine
St. Bonaventure	St. Bonaventure College	Thomas Plassmann
Saratoga Springs	Skidmore College	Henry T. Moore
Schenectady	Union College	Dixon Ryan Fox
Staten Island	Wagner Memorial Lutheran College	Clarence C. Stoughton
Syracuse	New York State College of Forestry	Samuel N. Spring, Dean
Syracuse	Syracuse City Normal School	Wm. W. Wright*
Syracuse	Syracuse University	C. Wesley Flint*
Tarrytown	Marymount College	Mother M. Gerard
Troy	Rensselaer Polytechnic Institute	Wm. O. Hotchkiss
Troy	Russell Sage College	J. L. Meader
West Point	United States Military Academy	W. D. Connor, Supt.
White Plains	Good Counsel College	Mother M. Aloysia
North Carolina		
Asheville	Asheville Normal & Teachers College	John E. Calfee
Boone	Appalachian State Teachers College	B. B. Dougherty
Chapel Hill	University of North Carolina	Frank P. Graham
Charlotte	Johnson C. Smith University	H. L. McCrorey
Charlotte	Queens Chicora College	W. H. Frazer
Cullowhee	Western Carolina Teachers College	H. T. Hunter
Davidson	Davidson College	Walter L. Lingle
Durham	Duke University	Wm. Preston Few
Durham	North Carolina College for Negroes	James E. Shepard
Elizabeth City	State Normal School	J. H. Bias
Elon College	Elon College	Leon E. Smith
Fayetteville	State Normal School	J. W. Seabrook
Greensboro	Agricultural & Technical College	F. D. Bluford
Greensboro	Bennett College	David D. Jones
Greensboro	Greensboro College	Luther L. Gobbel
Greensboro	The Woman's College of the University of N. C.	W. C. Jackson, Dean
Greenville	East Carolina Teachers College	Leon R. Meadows
Guilford College	Guilford College	Clyde A. Milner
Hickory	Lenoir Rhyne College	P. E. Monroe
High Point	High Point College	G. I. Humphreys
Murfreesboro	Chowan College	W. A. McGlohon
Raleigh	Meredith College	Charles E. Brewer
Raleigh	North Carolina State College of Agriculture & Engineering, University of North Carolina	John W. Harrelson, Dean
Raleigh	St. Augustine's College	Edgar H. Goold
Raleigh	Shaw University	Wm. Stuart Nelson
Red Springs	Flora MacDonald College	Henry G. Bedinger
Salisbury	Catawba College	Howard R. Omwake
Salisbury	Livingstone College	W. J. Trent
Wake Forest	Wake Forest College	Thurman D. Kitchin
Wilson	Atlantic Christian College	H. S. Hilley
Winston-Salem	Salem College	H. E. Rondthaler
Winston-Salem	Winston-Salem Teachers College	F. L. Atkins
North Dakota		
Dickinson	State Normal School	C. L. Kjerstad
Ellendale	State Normal & Industrial School	R. M. Black
Fargo	North Dakota Agricultural College	John H. Shepperd
Grand Forks	Wesley College	Charles L. Wallace
Jamestown	Jamestown College	B. H. Kroeze
Mayville	State Teachers College	Carl C. Swain
Minot	State Teachers College	G. A. McFarland
University	University of North Dakota	John C. West
Valley City	State Teachers College	C. E. Allen
Ohio		
Ada	Ohio Northern University	Robert Williams
Akron	University of Akron	H. E. Simmons
Alliance	Mount Union College	Wm. H. McMaster
Ashland	Ashland College	Charles L. Anspach
Athens	Ohio University	Herman G. James
Berea	Baldwin-Wallace College	Louis Clinton Wright
Bluffton	Bluffton College	A. S. Rosenberger
Bowling Green	Bowling Green State College	H. B. Williams
Cedarville	Cedarville College	W. R. McChesney
Cincinnati	Teachers College, Athenaeum of Ohio	Carl J. Ryan
Cincinnati	University of Cincinnati	Raymond Walters
Cincinnati	Xavier University	Dennis F. Burns
Cleveland	John Carroll University	B. J. Rodman
Cleveland	Case School of Applied Science	Wm. E. Wickenden
Cleveland	Fenn College	C. V. Thomas
Cleveland	Ursuline College	Mother M. Veronica Nash
Cleveland	Western Reserve University	W. G. Leutner
Columbus	Capital University	Otto Mees
Columbus	Ohio State University	G. W. Rightmire
Dayton	University of Dayton	Walter C. Tredtin
Defiance	Defiance College	F. W. Raymond
Delaware	Ohio Weslevan University	Edmund D. Soper
East Columbus	St. Mary of the Springs College	Sister M. Aloyse
Findlay	Findlay College	H. R. Dunathan
Gambier	Kenyon College	Wm. F. Peirce
Granville	Denison University	A. A. Shaw
Hiram	Hiram College	Kenneth I. Brown
Kent	Kent State College	J. O. Engleman
Marietta	Marietta College	Edward S. Parsons
Mount St. Joseph	Mount St. Joseph College	Mother Mary Regina
New Concord	Muskingum College	R. N. Montgomery
Oberlin	Oberlin College	Ernest H. Wilkins
Oxford	Miami University	Alfred H. Upham
Oxford	Western College	Ralph K. Hickok
Painesville	Lake Erie College	Vivian B. Small
South Euclid	Notre Dame College	Mother Mary Evarista
Springfield	Wittenberg College	Rees Edgar Tulloss
Tiffin	Heidelberg College	Charles E. Miller
Toledo	Mary Manse College	Sister Catherine Raynor
Toledo	St. John's College	G. A. Fitzgibbons
Toledo	Toledo Teachers College	Karl J. Alter
Toledo	University of Toledo	Philip Curtis Nash
Westerville	Otterbein College	W. G. Clippinger
Wilberforce	Wilberforce University	R. R. Wright, Jr.
Wilmington	Wilmington College	Walter L. Collins
Wooster	The College of Wooster	Charles F. Wishart
Yellow Springs	Antioch College	Arthur E. Morgan
Youngstown	Youngstown College	Howard W. Jones
Oklahoma		
Ada	East Central State Teachers College	A. Linscheid
Alva	Northwestern State Teachers College	Sabin C. Percefull
Chickasha	Oklahoma College for Women	M. A. Nash
Durant	Southeastern Teachers College	Kate G. Zaneis
Edmond	Central State Teachers College	John O. Moseley
Enid	Phillips University	I. N. McCash
Goodwell	Panhandle Agricultural & Mechanical College	J. Byron Dacus
Guthrie	Catholic College of Oklahoma for Women	Mother Mary Agnes Arvin
Langston	Colored Agricultural & Normal University	I. W. Young
Norman	University of Oklahoma	Wm. B. Bizzell
Oklahoma City	Oklahoma City University	A. G. Williamson
Shawnee	Oklahoma Baptist University	John W. Raley
Stillwater	Oklahoma Agricultural & Mechanical College	Henry G. Bennett
Tahlequah	Northeastern State Teachers College	J. M. Hackler
Tulsa	University of Tulsa	C. I. Pontius
Weatherford	Southwestern State Teachers College	C. W. Richards
Oregon		
Albany	Albany College	Thomas W. Bibb
Ashland	Southern Oregon State Normal School	Walter Redford
Corvallis	Oregon State College	George W. Peavy
Eugene	University of Oregon	Clarence V. Boyer
Forest Grove	Pacific University	John F. Dobbs
La Grande	Eastern Oregon Normal School	H. E. Inlow
McMinnville	Linfield College	Elam J. Anderson
Monmouth	Oregon Normal School	J. A. Churchill
Newberg	Pacific College	Levi T. Pennington
Oswego	Marylhurst College	Sister Mary Joan
Portland	North Pacific College	Herbert C. Miller
Portland	Reed College	Dexter M. Keezer
Portland	University of Portland	Joseph J. Boyle
Salem	Willamette University	Bruce R. Baxter
Pennsylvania		
Allentown	Cedar Crest College	Wm. F. Curtis
Allentown	Muhlenberg College	John A. W. Haas
Annville	Lebanon Valley College	Clyde A. Lynch
Beaver Falls	Geneva College	M. M. Pearce
Bethlehem	Lehigh University	Clement C. Williams
Bethlehem	Moravian College and Theological Seminary	Wm. N. Schwarze
Bethlehem	Moravian College for Women	Edwin J. Heath
Bloomsburg	State Teachers College	Francis B. Haas
Bryn Athyn	Academy of the New Church	N. D. Pendleton
Bryn Mawr	Bryn Mawr College	Marion E. Park
California	State Teachers College	Robert M. Steele

City	Institution	President
Pennsylvania— *Cont.*		
Carlisle	Dickinson College	Fred P. Corson
Chambersburg	Wilson College	E. D. Warfield
Chester	Crozier Theological Seminary	James H. Franklin
Chester	Pennsylvania Military College	Frank K. Hyatt
Chestnut Hill	Mount St. Joseph College	Mother Mary James
Cheyney	State Teachers College	L. P. Hill
Clarion	State Teachers College	G. C. L. Riemer
Collegeville	Ursinus College	George L. Omwake
Easton	Lafayette College	Wm. Mather Lewis
East Stroudsburg	State Teachers College	T. T. Allen
Edinboro	State Teachers College	Carmon A. Ross
Elizabethtown	Elizabethtown College	Ralph W. Schlosser
Erie	Mercyhurst College	Sister M. Xavier O'Neil
Erie	Villa Maria College	Joseph J. Wehrle
Gettysburg	Gettysburg College	H. W. A. Hanson
Greensburg	Seton Hill College	J. A. W. Reeves
Greenville	Thiel College	Earl S. Rudisill
Grove City	Grove City College	Weir C. Ketler
Haverford	Haverford College	W. W. Comfort
Huntingdon	Juniata College	Charles C. Ellis
Immaculata	Immaculata College	Vincent L. Burns
Indiana	State Teachers College	C. R. Foster
Jenkintown	Beaver College	W. B. Greenway
Kutztown	State Teachers College	Quincy A. W. Rohrbach
Lancaster	Franklin & Marshall College	John A. Schaeffer
Latrobe	St. Vincent College	Alfred Koch
Lewisburg	Bucknell University	Arnaud C. Marts, Acting
Lincoln Univ.	Lincoln University	Wm. H. Johnson
Lock Haven	State Teachers College	D. W. Armstrong
Loretto	St. Francis College	P. J. Sullivan
Mansfield	State Teachers College	W. R. Straughn
Meadville	Allegheny College	Wm. P. Tolley
Millersville	State Teachers College	Landis Tanger
New Wilmington	Westminster College	Robert F. Galbreath
Philadelphia	Drexel Institute	Parke R. Kolbe
Philadelphia	Dropsie College	Cyrus Adler
Philadelphia	Hahnemann Medical College of Philadelphia	W. A. Pearson
Philadelphia	Jefferson Medical College	Ross V. Patterson
Philadelphia	La Salle College	Brother E. Anselm
Philadelphia	Philadelphia College of Osteopathy	Edgar O. Holden
Philadelphia	Philadelphia College of Pharmacy & Science	Wilmer Krusen
Philadelphia	St. Joseph's College	Thomas J. Higgins
Philadelphia	Temple University	Charles E. Beury
Philadelphia	University of Pennsylvania	Thomas S. Gates
Philadelphia	Women's Medical College of Pennsylvania	James Starr
Pittsburgh	Carnegie Institute of Technology	
Pittsburgh	Duquesne University	J. J. Callahan
Pittsburgh	H. C. Frick Training School for Teachers	Dana Z. Eckert*
Pittsburgh	Mount Mercy College	Mother M. Irenaeus
Pittsburgh	Pennsylvania College for Women	Herbert L. Spencer
Pittsburgh	University of Pittsburgh	John G. Bowman, Chancellor
Reading	Albright College	J. Warren Klein
Rosemont	Rosemont College	Mother Mary Ignatius
Scranton	Marywood College	Mother M. Josepha
Scranton	St. Thomas College	Brother D. Edward
Selinsgrove	Susquehanna University	G. Morris Smith
Shippensburg	State Teachers College	A. L. Rowland
Slippery Rock	State Teachers College	C. S. Miller
State College	Pennsylvania State College	Ralph D. Hetzel
Swarthmore	Swarthmore College	Frank Aydelotte
Villanova	Villanova College	E. V. Stanford
Washington	Washington & Jefferson College	Ralph Cooper Hutchison
Waynesburg	Waynesburg College	Paul R. Stewart
West Chester	State Teachers College	N. W. Cameron
Rhode Island		
Kingston	Rhode Island State College	Ray. G. Bressler
Providence	Brown University	C. A. Barbour
Providence	Rhode Island College of Education	John L. Alger
Providence	Rhode Island College of Pharmacy & Allied Sciences	M. H. Corrigan
South Carolina		
Charleston	The Citadel—The Military College of South Carolina	Chas. P. Summerall
Charleston	College of Charleston	Harrison Randolph
Charleston	Medical College of the State of South Carolina	Robert Wilson, Dean
Clemson College	Clemson Agricultural College	Enoch W. Sikes
Clinton	Presbyterian College	William P. Jacobs
Columbia	Allen University	Abram L. Simpson
Columbia	Benedict College	J. J. Starks
Columbia	Columbia College	J. Caldwell Guilds
Columbia	University of South Carolina	L. T. Baker
Due West	Erskine College	Robert C. Grier
Gaffney	Limestone College	R. C. Granberry
Greenville	Furman University	B. E. Geer
Greenville	Greenville Woman's College	B. E. Geer
Greenwood	Lander College	J. W. Speake
Hartsville	Coker College	Carlyle Campbell
Newberry	Newberry College	James C. Kinard
Orangeburg	Claflin College	J. B. Randolph
Orangeburg	State Agricultural and Mechanical College	M. F. Whittaker
Rock Hill	Winthrop College	Shelton Phelps
Spartanburg	Converse College	Edward M. Gwathmey
Spartanburg	Wofford College	Henry N. Snyder
South Dakota		
Aberdeen	Northern State Teachers College	Carl G. Lawrence
Brookings	South Dakota State College of Agriculture & Mechanic Arts	C. W. Pugsley
Huron	Huron College	Frank L. Eversull
Madison	Eastern State Normal School	V. A. Lowry
Mitchell	Dakota Weslevan University	Earl A. Roadman
Rapid City	State School of Mines	Joseph P. Connolly
Sioux Falls	Augustana College	Clemens M. Granskou
Sioux Falls	Sioux Falls College	C. R. Sattgast
Spearfish	Spearfish Normal School	E. C. Woodburn
Springfield	Southern State Normal School	W. A. Thompson
Vermilion	University of South Dakota	I. D. Weeks
Yankton	Yankton College	G. W. Nash
Tennessee		
Bristol	King College	Thomas P. Johnston
Chattanooga	University of Chattanooga	Alexander Guerry
Clarksville	Austin Peay Normal School	P. P. Claxton
Cookeville	Tennessee Polytechnic Institute	Q. M. Smith
Greenville	Tusculum College	C. A. Anderson
Harrogate	Lincoln Memorial University	S. W. McClelland
Jackson	Lambuth College	Richard E. Womack
Jackson	Lane College	J. F. Lane
Jackson	Union University	John J. Hurt
Jefferson City	Carson-Newman College	James T. Warren
Johnson City	State Teachers College	C. C. Sherrod
Knoxville	Knoxville College	J. Kelly Giffen
Knoxville	The University of Tennessee	James D. Hoskins
Lebanon	Cumberland University	Ernest L. Stockton
McKenzie	Bethel College	L. L. Thomas
Madison	Nashville Agricultural Normal Institute	E. A. Sutherland
Maryville	Maryville College	Ralph Waldo Lloyd
Memphis	Southwestern	Charles E. Diehl
Memphis	State Teachers College	J. W. Brister
Milligan College	Milligan College	H. J. Derthick
Murfreesboro	State Teachers College	P. A. Lyon
Murfreesboro	Tennessee College for Women	E. L. Atwood
Nashville	Fisk University	Thomas E. Jones
Nashville	George Peabody College for Teachers	Bruce R. Payne
Nashville	Scarritt College for Christian Workers	Jesse Lee Cunningim
Nashville	Tennessee Agricultural & Industrial State College	W. J. Hale
Nashville	Vanderbilt University	James H. Kirkland
Sewanee	University of the South	Benj. F. Finney
Texas		
Abilene	Abilene Christian College	James F. Cox
Abilene	Hardin-Simmons University	J. D. Sandefer
Abilene	McMurry College	T. W. Brabham
Alpine	Sul Ross State Teachers College	H. W. Morelock
Austin	Samuel Huston College	Stanley E. Grannum
Austin	St. Edward's University	Joseph Maguire
Austin	Tillotson College	Mary E. Branch
Austin	The University of Texas	H. Y. Benedict
Belton	Mary Hardin-Baylor College	J. C. Hardy
Brownwood	Daniel Baker College	Robert Guy Davis
Brownwood	Howard Payne College	Thomas H. Taylor
Canyon	West Texas State Teachers College	J. A. Hill
College Station	Texas Agricultural & Mechanical College	T. O. Walton
Commerce	East Texas State Teachers College	Sam H. Whitley
Dallas	Southern Methodist University	Chas. C. Selecman
Denton	North Texas State Teachers College	W. J. McConnell
Denton	Texas State College for Women	Louis H. Hubbard
El Paso	College of Mines and Metallurgy	D. M. Wiggins
Fort Worth	Texas Christian University	Edward McS. Waits
Fort Worth	Texas Wesleyan College	T. W. Brabham
Georgetown	Southwestern University	J. W. Bergin, Acting

City	Institution	President
Texas—*Cont.*		
Houston	The Rice Institute	Edgar Odell Lovett
Huntsville	Sam Houston State Teachers College	H. F. Estill
Kingsville	Texas College of Arts & Industries	J. O. Soften
Lubbock	Texas Technological College	Bradford Knapp
Marshall	Bishop College	Joseph J. Rhoads
Marshall	Wiley College	M. W. Dogan
Nacogdoches	Stephen F. Austin State Teachers College	A. W. Birdwell
Prairie View	Prairie View State College	W. R. Banks*
San Antonio	Incarnate Word College	Sister M. Columkille
San Antonio	Our Lady of the Lake College	H. A. Constantineau
San Antonio	St. Mary's University	Alfred H. Rabe
San Marcos	Southwest Texas State Teachers College	C. E. Evans
Sherman	Austin College	Everett B. Tucker
Tyler	Texas College	D. R. Glass
Waco	Baylor University	Pat Neff
Waxahachie	Trinity University	Raymond H. Leach
Utah		
Logan	Utah State Agricultural College	Elmer G. Peterson
Provo	Brigham Young University	Franklin S. Harris
Salt Lake City	St. Mary-of-the-Wasatch	Sister Mary Veronique
Salt Lake City	University of Utah	George Thomas
Vermont		
Bennington	Bennington College	Robert D. Leigh
Burlington	University of Vermont & State Agricultural College	Guy W. Bailey
Castleton	State Normal School	C. S. Woodruff*
Johnson	State Normal School	Donald W. McClelland
Middlebury	Middlebury College	Paul D. Moody
Northfield	Norwich University	Porter H. Adams
Winooski	St. Michael's College	L. E. Gosselin
Virginia		
Alexandria	Protestant Episcopal Theological Seminary	W. E. Rollins
Ashland	Randolph Macon College	Rob't E. Blackwell
Blacksburg	Virginia Polytechnic Institute	Julian A. Burruss
Bridgewater	Bridgewater College	Paul H. Bowman
Charlotteville	University of Virginia	John Lloyd Newcomb
Dayton	Shenandoah College & Conservatory of Music	Wade S. Miller
East Radford	State Teachers College	John P. McConnell
Emory	Emory & Henry College	J. N. Hillman
Farmville	State Teachers College	J. L. Jarman
Fredericksburg	State Teachers College	Morgan L. Combs
Hampden-Sydney	Hampden-Sydney College	J. D. Eggleston
Hampton	Hampton Institute	Arthur Howe
Harrisonburg	State Teachers College	S. P. Duke
Hollins	Hollins College	Bessie C. Randolph
Lawrenceville	St. Paul Normal & Industrial School	J. A. Russell
Lexington	Virginia Military Institute	J. A. Lejeune, Supt.
Lexington	Washington & Lee University	Francis P. Gaines
Lynchburg	Lynchburg College	J. T. T. Hundley
Lynchburg	Randolph-Macon Woman's College	Theo. Henley Jack
Lynchburg	Virginia Theological Seminary and College	W. H. R. Powell
Montgomery	New River State College	Edward S. Maclin
Petersburg	Virginia State College for Negroes	John M. Gandy
Richmond	Medical College of Virginia	William T. Sanger
Richmond	University of Richmond	F. W. Boatwright
Richmond	Virginia Union University	William J. Clark
Salem	Roanoke College	Chas. J. Smith
Staunton	Mary Baldwin College	L. Wilson Jarman
Sweet Briar	Sweet Briar College	Meta Glass
Williamsburg	College of William & Mary	John Stewart Bryan
Washington		
Bellingham	State Normal School	C. H. Fisher
Cheney	State Normal School	R. T. Hargreaves
College Place	Walla Walla College	Wm. M. Landeen
Ellensburg	Washington State Normal School	Rob't E. McConnell
Pullman	State College of Washington	Ernest O. Holland
Seattle	Seattle Pacific College	Charles H. Watson
Seattle	University of Washington	Lee Paul Sieg
Spokane	Gonzaga University	Francis C. Dillon
Spokane	Whitworth College	Ward W. Sullivan
Tacoma	College of Puget Sound	Edward H. Todd
Walla Walla	Whitman College	Rudolf A. Clemen
West Virginia		
Athens	Concord State Teachers College	J. Frank Marsh
Bethany	Bethany College	W. H. Cramblet
Bluefield	Bluefield State Teachers College	R. P. Sims
Buckhannon	West Virginia Wesleyan College	Roy McCuskey
Charleston	Morris Harvey College	Leonard Riggleman
Elkins	Davis & Elkins College	Chas. E. Albert, Acting
Fairmont	Fairmont State Teachers College	Joseph Rosier
Glenville	Glenville State Teachers College	E. G. Rohrbough
Harpers Ferry	Storer College	H. T. McDonald
Huntington	Marshall College	James E. Allen
Institute	West Virginia State College	John W. Davis
Morgantown	West Virginia University	C. S. Boucher
Salem	Salem College	S. Orestes Bond
Shepherdstown	Shepherd State Teachers College	W. H. S. White
West Liberty	West Liberty State Teachers College	Paul N. Elbin
Wisconsin		
Appleton	Lawrence College	Henry M. Wriston
Ashland	Northland College	J. D. Brownell
Beloit	Beloit College	Irving Maurer
Eau Claire	State Teachers College	H. A. Schofield
La Crosse	State Teachers College	Geo. M. Snodgrass
Madison	University of Wisconsin	Glenn Frank
Menomonie	The Stout Institute	Burton E. Nelson
Milton	Milton College	Jay W. Crofoot
Milwaukee	Marquette University	William M. Magee
Milwaukee	Milwaukee-Downer College	Lucia R. Briggs
Milwaukee	Mount Mary College	Edw. A. Fitzpatrick
Milwaukee	State Teachers College	Frank E. Baker
Nashotah	Nashotah House	E. J. M. Nutter
Oshkosh	State Teachers College	Forrest R. Polk
Platteville	State Teachers College	Asa M. Royce
Plymouth	Mission House College	Paul Grosshuesch
Ripon	Ripon College	Silas Evans
River Falls	State Teachers College	J. H. Ames
Stevens Point	State Teachers College	Frank S. Hyer
Superior	State Teachers College	Jim Dan Hill
Watertown	Northwestern College	Erwin E. Kowalke
Waukesha	Carroll College	Wm. A. Ganfield
West De Pere	St. Norbert College	B. H. Pennings
Whitewater	State Teachers College	C. M. Yoder
Wyoming		
Laramie	University of Wyoming	Arthur G. Crane
Outlying Possessions		
College, Alaska	University of Alaska	Charles E. Bunnell
Honolulu, Hawaii	Teachers College, University of Hawaii	Benjamin O. Wist, Dean
Honolulu, Hawaii	University of Hawaii	David L. Crawford
Dumaguete, Philippine Islands	Silliman University	Roy H. Brown
Manila, Philippine Islands	Mapua Institute of Technology	Thomas Mapua
Rio Piedras, Porto Rico	University of Puerto Rico	J. J. Osuna, Acting
Canada		
Antigonish, N. S.	St. Francis Xavier University	H. P. MacPherson
Aurora, Ont.	St. Andrew's College	Kenneth G. B. Ketchum
Belleville, Ont.	Albert College	Bert Howard
Charlottetown, P. E. I.	St. Dunstan's University	J. A. Murphy
Edmonton, Alta.	Alberta College	F. S. McCall*
Edmonton, Alta.	University of Alberta	R. C. Wallace
Fredericton, N. B.	University of New Brunswick	C. C. Jones
Halifax, N. S.	Dalhousie University	Carleton Stanley
Halifax, N. S.	Halifax Ladies College	E. Florence Blackwood
Halifax, N. S.	University of King's College	A. H. Moore
Hamilton, Ont.	McMaster University	H. P. Whidden, Chancellor
Kingston, Ont.	Queen's University	W. H. Fyfe*
Kitchener, Ont.	St. Jerome's College	Robert S. Dehler
Lennoxville, Que.	Bishop's University	A. H. McGreer*
London, Ont.	University of Western Ontario	Wm. Sherwood Fox
Montreal, Que.	Loyola College	H. C. McCarthy
Montreal, Que.	McGill University	A. E. Morgan
Montreal, Que.	Montreal University	Olivier Maurault
Ottawa, Ont.	University of Ottawa	G. Marchand
Ottawa, Ont.	Ottawa University Normal School	Rene Lamoureux*
Quebec, Que.	Laval University	Camille Roy
Regina, Sask.	Regina College	E. W. Stapleford
St. Joseph, N. B.	St. Joseph's University	L. Lapalme
St. Thomas, Ont.	Alma College	P. S. Dobson*
Saskatoon, Sask.	University of Saskatchewan	W. C. Murray
Stanstead, Que.	Stanstead Wesleyan College	E. C. Amaron*
Toronto, Ont.	University of Toronto	H. J. Cody
Toronto, Ont.	Upper Canada College	T. W. L. MacDermot
Toronto, Ont.	Victoria University	E. W. Wallace
Truro, N. S.	Nova Scotia Agricultural College	J. M. Trueman*
Vancouver, B. C.	University of British Columbia	Leonard S. Klinck
Winnipeg, Man.	University of Manitoba	Sidney E. Smith
Winnipeg, Man.	Wesley College	John H. Riddell
Wolfville, N. S.	Arcadia University	F. W. Patterson

Section XI

PRESIDENTS OF JUNIOR COLLEGES

City	Institution	President
Alabama		
Marion	Marion Institute	Walter I. Murfee
St. Bernard	St. Bernard College	Ambrose Reger
Arizona		
Phoenix	Phoenix Junior College	E. W. Montgomery
Thatcher	Gila Junior College	E. Edgar Fuller
Arkansas		
Fort Smith	Fort Smith Junior College	J. W. Ramsey
Jonesboro	Jonesboro Baptist College	H. E. Walters
Little Rock	Little Rock Junior College	J. A. Larson
Magnolia	State Agricultural & Mechanical College	C. A. Overstreet
Monticello	Fourth District Agricultural & Mechanical College	Hugh Crits
Russellville	Arkansas Polytechnic College	J. W. Hull
Sheridan	Missionary Baptist College	J. W. Overall
California		
Arlington	Southern California Junior College	E. E. Cossentine
Azusa	Citrus Junior College	F. S. Hayden
Bakersfield	Bakersfield Junior College	Grace V. Bird, Dean
Berkeley	Armstrong Junior College	J. Evan Armstrong
Berkeley	Williams Institute	Cora L. Williams
Brawley	Brawley Junior College	Percy E. Palmer
Compton	Compton Junior College	O. Scott Thompson
El Centro	Central Junior College	J. L. House
Fresno	Fresno Technical Junior College	R. F. Aspinall
Fullerton	Fullerton Junior College	Louis E. Plummer
Glendale	Glendale Junior College	Charles A. Nelson
Hollister	San Benito County Junior College	Claude N. Settles
Kentfield	Marin Junior College	A. C. Olney
Lancaster	Antelope Valley Junior College	Roy A. Knapp
Long Beach	Long Beach Junior College	John L. Lounsbury
Los Angeles	Cumnock College	Raymond C. Brooks
Los Angeles	Los Angeles Junior College	Roscoe C. Ingalls
Los Angeles	Los Angeles Pacific College	Byron S. Lamson
Menlo Park	Menlo School & Junior College	Lowry S. Howard
Modesto	Modesto Junior College	D. C. Baker
Ontario	Chaffey Junior College	T. E. Chaffee, Bus. Mgr.
Pasadena	Pasadena Junior College	John W. Harbeson
Pomona	Pomona Junior College	J. E. Walker
Porterville	Porterville Junior College	B. H. Grisemer
Reedley	Reedley Junior College	J. O. McLaughlin
Riverside	Riverside Junior College	A. G. Paul
Salinas	Salinas Junior College	J. B. Lemos
San Bernardino	San Bernardino Valley Union Junior College	Nicholas Ricciardi
San Francisco	Cogswell Polytechnical College	George B. Miller
San Francisco	Golden Gate College	Nagel T. Miner
San Luis Obispo	California Polytechnic School	Julian A. McPhee
San Mateo	San Mateo Junior College	Charles S. Morris
Santa Ana	Santa Ana Junior College	D. K. Hammond
Santa Maria	Santa Maria Junior College	A. P. Hill, Jr.
Santa Monica	Santa Monica Junior College	Ralph H. Bush
Santa Rosa	Santa Rosa Junior College	Floyd P. Bailey
Susanville	Lasser Union Junior College	I. V. Funderburgh
Taft	Taft Junior College	Frank A. Bauman
Ventura	Ventura Junior College	D. R. Henry
Visalia	Visalia Junior College	I. D. Steele
Colorado		
Denver	Colorado Vocational College	Rolland M. Shreves
Denver	Colorado Woman's College	J. E. Hutchingson
Grand Junction	Grand Junction State Junior College	Clifford G. Houston
Trinidad	Trinidad State Junior College	William R. Ross
Connecticut		
Bridgeport	Junior College of Connecticut	E. Everett Cortright
Greenwich	Edgewood Park Junior College	M. H. Reaser
New Haven	Larson Junior College	George V. Larson
Thompson	Marot Junior College	Mary L. Marot
West Hartford	St. Joseph College	Sister M. Rosa
District of Columbia		
Washington	Arlington Hall Junior College	Carrie Sutherlin
Washington	Fairmont Junior College	Maud van Woy
Washington	Immaculata Seminary	Sister Catharine Agnes
Washington	Marjorie Webster Schools, Inc.	Marjorie Webster
Florida		
De Funiak Springs	Palmer College	F. W. Haverkamp
St. Petersburg	St. Petersburg Junior College	Robert B. Reed, Dean
Sarasota	Ringling Junior College	Vernon Kimbrough
Georgia		
Barnesville	Gordon Military College	J. E. Guillebeau
Cochran	Middle Georgia College	L. H. Browning
Cuthbert	Andrew College	S. C. Olliff
Dahlonega	North Georgia College	Jonathan C. Rogers
Douglas	South Georgia State College	J. M. Thrash
Mount Vernon	Brewton-Parker Junior College	A. M. Gates
Young Harris	Young L. G. Harris College	T. Jack Lance
Idaho		
Coeur d'Alene	Coeur d'Alene Junior College	J. Lester Dalton, Acting Dean
Pocatello	University of Idaho, Southern Branch	O. D. Garrison, Bursar
Rexburg	Ricks College	Hyrum Manwaring
Illinois		
Carlinville	Blackburn College	William M. Hudson
Chicago	Chicago Christian College	Frederick H. Wezeman
Chicago	Herzl Junior College	Dorph Brown, Dean
Chicago	North Park College	Algoth Ohlson
Chicago	Peoples Junior College	Philip L. Seman
Chicago	South Side City Junior College	Butler Laughlin
Chicago	George Williams College	Hedley S. Dimock, Acting
Chicago	Wright Junior College	W. H. Conley, Dean
Cicero	Morton Junior College	L. R. Hrudka
Godfrey	Monticello College	George I. Rohrbough
Harvey	Thornton Junior College	William E. McVey
Joliet	Joliet Junior College	W. W. Haggard
La Grange	Lyons Township Junior College	Chas. F. Van Cleve
Lincoln	Lincoln College	Wm. D. Copeland
Mt. Carroll	Frances Shimer Junior College	A. Beth Hostetter
Quincy	Quincy College	Vincent A. Fochtman
Indiana		
Collegeville	St. Joseph's College	Joseph B. Kenkel
Fort Wayne	Concordia College	William C. Burhop
Kokomo	Kokomo Junior College	J. W. Beauchamp
Vincennes	Vincennes University	Walter A. Davis
Iowa		
Albia	Albia Junior College	John S. Chambers
Britt	Britt Junior College	L. J. Thies
Burlington	Burlington Junior College	Ray H. Bracewell
Centerville	Centerville Junior College	E. Wayne Hilmer
Chariton	Chariton Junior College	F. A. Lunan
Clarinda	Clarinda Junior College	Richard D. Rowley
Clinton	Mount St. Clare Junior College	Mother M. Paul Carrico
Creston	Creston Junior College	V. L. Sanders
Des Moines	Grand View Junior College	C. Arild Olsen
Eagle Grove	Eagle Grove Junior College	C. L. McDowell
Elkader	Elkader Public Junior College	J. Dale Welsch
Emmetsburg	Emmetsburg Junior College	R. W. Newell
Estherville	Estherville Junior College	W. A. Cresap
Forest City	Waldorf College	J. L. Rendahl
Fort Dodge	Fort Dodge Junior College	A. C. Nielsen, Dean
Hopkinton	Lenox College	E. V. Laughlin, Dean
Independence	Independence Junior College	Q. A. Wemple, Dean
Iowa Falls	Ellsworth Junior College	Sheridan R. Jones
Lamoni	Graceland College	G. N. Briggs
Mason City	Mason City Junior College	James Rae
Muscatine	Muscatine Junior College	Willetta Strahan
Orange City	Northwestern Junior College	Jacob Heemstra
Osceola	Osceola Junior College	Lillian V. Hjort
Red Oak	Red Oak Junior College	J. R. Inman
Tipton	Tipton Junior College	C. W. Cowan
Washington	Washington Junior College	Harland W. Mead
Waverly	Wartburg College	E. J. Braulick
Webster City	Webster City Junior College	Harry L. Rice
Kansas		
Arkansas City	Arkansas City Junior College	E. A. Funk
Coffeyville	Coffeyville Junior College	E. C. McReynolds

City	Institution	President
Kansas—*Cont.*		
El Dorado	El Dorado Junior College	Earl Walker
Garden City	Garden City Junior College	Ira O. Scott
Haviland	Friends Bible College	Bernard E. Mott
Hesston	Hesston College & Bible School	Milo K. Kauffman, Dean
Highland	Highland College	C. M. Rankin
Hutchinson	Hutchinson Junior College	C. M. Lockman
Independence	Independence Junior College	E. R. Stevens
Iola	Iola Junior College	R. H. Carpenter
Kansas City	Kansas City Junior College	J. F. Wellemeyer
McPherson	Central Academy & Junior College	Charles A. Stoll
Paola	College of Paola & Ursuline Academy	Mother Jerome Schaub
Parsons	Parsons Junior College	E. F. Farner
Winfield	St. John's College	A. M. Rehwinkel
Kentucky		
Campbellsville	Campbellsville Junior College	D. J. Wright
Columbia	Lindsey-Wilson Junior College	A. P. White
Covington	Villa Madonna College	M. Leick
Hopkinsville	Bethel Woman's College	J. W. Gaines
Jackson	Lees College	J. O. Van Meter
London	Sue Bennett College	K. C. East
Louisville	Sacred Heart College	Sister M. Dominica, Dean
Paducah	Paducah Junior College	Norman A. Braden, Dean
Pikesville	Pikesville Junior College	Frank D. McClelland
Pippapass	Caney Junior College	Charles Houghton, Dean
St. Catherine	St. Catherine Junior College	Sister Bonaventure, Dean
St. Joseph	Mount St. Joseph Junior College	Sister M. C. Eckmans Dean
St. Mary	St. Mary's College	Francis J. Jaglowicz
Louisiana		
Grand Coteau	Normal College & Academy of Sacred Heart	Mother Fitzwilliam
Hammond	Southeastern Louisiana College	Y. L. Fontenot
LaFayette	De La Salle Normal School	Brother A. Arsenius
Monroe	Northeast Center, L. S. U.	C. C. Colvert
Shreveport	Dodd College	E. C. Solomon
Shreveport	St. Vincent's College	Sister Maria Immaculata
Maine		
Portland	Westbrook Junior College	Milton W. Proctor
Springvale	Nasson Institute	Dawn N. Wallace
Maryland		
Catonsville	St. Charles College	George A. Gleason
New Windsor	Blue Ridge College	Edward C. Bixler
St. Mary's City	St. Mary's Seminary & Junior College	M. Adele France
Massachusetts		
Auburndale	Lasell Junior College	Guy M. Winslow
Bradford	Bradford Junior College	Katharine M. Denworth
Dudley	Nichols Junior College	James L. Conrad
Wellesley	Pine Manor Junior College	Marie W. Potter
Michigan		
Adrian	St. Joseph's College & Academy	Mother M. Gerald
Bay City	Bay City Junior College	George E. Butterfield
Flint	Flint Junior College	W. S. Shattuck
Grand Rapids	Grand Rapids Junior College	Arthur Andrews
Highland Park	Highland Park Junior College	George I. Altenburg
Ironwood	Ironwood Junior College	Ernest Dear
Jackson	Jackson Junior College	Frank J. Dove, Dean
Muskegon	Muskegon Junior College	A. G. Umbreit
Port Huron	Port Huron Junior College	T. C. Simpson, Acting Dean
Spring Arbor	Spring Arbor Seminary & Junior College	LeRoy M. Lowell
Minnesota		
Coleraine	Itasca Junior College	Carl C. Guise
Duluth	Duluth Junior College	R. D. Chadwick
Ely	Ely Junior College	J. H. Santo
Eveleth	Eveleth Junior College	O. H. Gibson
Hibbing	Hibbing Junior College	H. A. Drescher
Rochester	Rochester Junior College	R. W. Goddard
St. Paul	Concordia College	Martin Graebner
Virginia	Virginia Junior College	Floyd B. Moe
Mississippi		
Clinton	Hillman College	M. P. L. Berry
Decatur	East Central Junior College	L. O. Todd
Goodman	Holmes Junior College	M. McDaniel
Gulfport	Gulf Park College	Richard G. Cox
Holly Springs	Mississippi Synodical College	R. F. Cooper
Mathiston	Bennett Academy	Jasper Weber
Moorhead	Sunflower Junior College	Paul M. West
Raymond	Hinds Junior College	G. J. Cain
Scooba	East Mississippi Junior College	J. D. Wallace
Senatobia	Northwest Mississippi Junior College	S. R. Dean
Summit	Southwest Mississippi Junior College	J. M. Kenna
Vicksburg	All Saints Junior College	Theodore D. Bratton
Wesson	Copiah Lincoln Junior College	James M. Ewing
Missouri		
Bolivar	Southwest Baptist College	Courts Redford
Columbia	Christian College	Eugene S. Briggs
Columbia	Stephens College	James M. Wood
Conception	Conception Junior College	Thomas Allen, Dean
Flat River	Flat River Junior College	Wesley A. Deneke, Dean
Fulton	William Woods College	H. G. Harmon
Hannibal	Hannibal-La Grange College	Andrew F. Morris
Iberia	Iberia Junior College	G. Byron Smith
Jefferson City	Jefferson City Junior College	William F. Knox
Kansas City	St. Teresa's Junior College	Mother Marcella
Kansas City	University of Kansas City	C. N. Newcomb
Kansas City	Western College	R. T. Frye
Moberly	Moberly Junior College	M. F. Beach
Monett	Monett Junior College	M. L. Coleman
Nevada	Cottey Junior College for Women	Florence E. Boehmer
St. Joseph	St. Joseph Junior College	Nelle Blum
Trenton	Trenton Junior College	W. H. McDonald
Warrenton	Central Wesleyan College	Franklin F. Lewis
Montana		
Havre	Northern Montana College	G. H. Vande Bogart
Nebraska		
Hebron	Hebron College and Academy	Walter H. Hellman
McCook	McCook Junior College	J. E. Shedd
Scottsbluff	Scottsbluff Junior College	Archer L. Burnham
Wahoo	Luther College	Paul M. Lindberg
New Hampshire		
New London	Colby Junior College	H. Leslie Sawyer
New Jersey		
Hackensack	Junior College of Bergen County	C. L. Littel
Long Branch	Monmouth Junior College	Edward G. Schlaefer Dean
Morristown	Morris County Junior College	Robert W. Bond
Newark	Essex County Junior College	Byron W. Hartley
Paterson	College of Paterson	Herbert S. Robinson
Paterson	Passaic County Junior College	Kenneth B. White
Perth Amboy	Middlesex County Junior College	Alfred M. Potts, 2nd
Trenton	Rider College	F. F. Moore
New Mexico		
Portales	Eastern New Mexico Junior College	Donald W. Mackay
New York		
Briarcliff Manor	Briarcliff Junior College	Doris L. Flick
Bronxville	Concordia Collegiate Institute	George A. Romoser
North Chili	A. M. Chesbrough Seminary	Merlin G. Smith
North Carolina		
Banner Elk	Lees-McRae College	Edgar H. Tufts
Belmont	Belmont Abbey College	Vincent Taylor
Boiling Springs	Boiling Springs Junior College	A. C. Lovelace
Buies Creek	Campbell College	L. H. Campbell
Louisburg	Louisburg College	Armour D. Wilcox
Mars Hill	Mars Hill College	Robert Lee Moore
Misenheimer	Pfeiffer Junior College	W. S. Sharp
Montreat	Montreat College	R. C. Anderson
Raleigh	Peace Junior College	William C. Pressly
Raleigh	St. Mary's School & Junior College	Mrs. Ernest Cruikshank
Rutherford College	Rutherford College	R. L. Patton
Salemburg	Pineland Junior College	W. J. Jones
Statesville	Mitchell College	Mrs. W. B. Ramsay
Wingate	Wingate Junior College	Coy Muckle
North Dakota		
Bottineau	North Dakota School of Forestry	Raymond W. McLees
Wahpeton	North Dakota State School of Science	E. F. Riley
Ohio		
Rio Grande	Rio Grande Junior College	William A. Lewis
Urbana	Urbana University	Russell Eaton

City	Institution	President
Oklahoma		
Altus	Altus Junior College	A. G. Steele
Bacone	Bacone College	B. D. Weeks
Bartlesville	Bartlesville Junior College	Paul C. Norvell
Bristow	Bristow Junior College	E. H. Black
Claremore	Oklahoma Military Academy	Walter E. Downs
Lawton	Cameron State Agricultural College	Charles M. Conwill
Miami	Northeastern Oklahoma Junior College	John F. Holcomb
Muskogee	Muskogee Junior College	Bessie M. Huff
Okmulgee	Okmulgee Junior College	W. Max Chambers
Seminole	Seminole Junior College	O. D. Johns
Tonkawa	University Preparatory School & Junior College	R. R. Robinson
Tulsa	Monte Cassino Junior College	Sister M. Hildegarde
Warner	Connors State Agricultural College	Jacob Johnson
Wetumka	Wetumka Junior College	Albert Hart
Wilburton	Eastern Oklahoma College	E. E. Tourtellotte
Woodward	Woodward Junior College	E. H. Homberger
Pennsylvania		
Cambridge Springs	Alliance College	Edward N. Kuberski, Dean
Chambersburg	Penn Hall	Frank S. Magill
La Plume	Keystone Junior College	Byron S. Hollinshead
Lititz	Linden Hall Junior College & School for Girls	F. W. Stengel
South Carolina		
Anderson	Anderson College	Annie D. Denmark
Central	Wesleyan Methodist College	John F. Childs
Spartanburg	Textile Industrial Institute	R. B. Burgess
South Dakota		
Freeman	Freeman Junior College	Benjamin P. Waltner
Mitchell	Notre Dame Junior College	J. M. Brady
Wessington Springs	Wessington Springs Junior College	Harry B. Ansted
Tennessee		
Athens	Tennessee Wesleyan College	James L. Robb
Collegedale	Southern Junior College	Henry J. Klooster
Nashville	David Lipscomb College	E. H. Ijams
Nashville	Treveeca Nazarene College	C. E. Hardy
Pulaski	Martin College	Sinclair Daniel
Rogersville	Swift Memorial College	C. E. Tucker
Texas		
Amarillo	Amarillo Junior College	J. F. Mead
Arlington	North Texas Agricultural College	E. E. Davis, Dean
Beaumont	Lamar College	C. W. Bingman
Cisco	Randolph Junior College	J. J. McKissick
Clarendon	Clarendon College	R. E. Druman
Clifton	Clifton Junior College	C. Tyssen
Decatur	Decatur Baptist College	J. L. Ward
Fort Worth	Our Lady of Victory College	Mother M. Albertine
Gainesville	Gainesville Junior College	H. O. McCain
Hillsboro	Hillsboro Junior College	L. W. Hartsfield
Houston	Houston Junior College	N. K. Dupre, Dean
Jacksonville	Jacksonville College	B. J. Albritton
Keene	Southwestern Junior College	H. H. Hamilton
Kerrville	Schreiner Institute	J. J. Delaney
Marshall	College of Marshall	F. S. Groner
Paris	Paris Junior College	J. R. McLemore
Plainview	Wayland College	G. W. McDonald
Ranger	Ranger Junior College	William T. Walton
San Angelo	San Angelo College	Felix E. Smith
San Antonio	San Antonio Junior College	J. E. Nelson
Seguin	Texas Lutheran College	Wm. E. Kraushaar
Stephenville	John Tarleton Agricultural College	J. Thomas Davis, Dean
Tehuacana	Westminster College	Clarence A. Sutton
Temple	Temple Junior College	L. C. Proctor
Terrell	Texas Military College	C. Williamson, Bus. Mgr.
Texarkana	Texarkana Junior College	H. W. Stilwell
Tyler	Tyler Junior College	H. E. Jenkins, Dean
Weatherford	Weatherford College	R. G. Boger
Wichita Falls	Wichita Falls Junior College	H. D. Fillers
Utah		
Ogden	Weber College	L. H. Greer
St. George	Dixie Junior College	B. Glen Smith
Salt Lake City	Westminster College	H. W. Reherd
Vermont		
Poultney	Green Mountain Junior College	Jesse P. Bogue
Virginia		
Blackstone	Blackstone College for Girls	W. B. Gates
Bluefield	Bluefield College	Edwin C. Wade
Bristol	Sullins College	W. E. Martin
Bristol	Virginia Intermont College	H. G. Noffsinger
Buena Vista	Southern Seminary	Robert Lee Durham
Danville	Averett College	J. W. Cammack
Danville	Stratford College	John C. Simpson
Dayton	Shenandoah College & Conservatory of Music	Wade S. Miller
Harrisonburg	Eastern Mennonite School	John L. Stauffer, Acting
Marion	Marion College	E. H. Copenhaver
Petersburg	Southern College	Arthur K. Davis
Washington		
Aberdeen	Grays Harbor Junior College	Lewis Tidball
Centralia	Centralia Junior College	Margaret Corbet
Lacey	St. Martin's College	Lambert Burton
Mount Vernon	Mount Vernon Junior College	Charles H. Lewis
Parkland	Pacific Lutheran College	O. A. Tingelstad
Spokane	Spokane Junior College	G. H. Schlauch
Yakima	Yakima Valley Junior College	Elizabeth A. Prior
West Virginia		
Keyser	Potomac State School	J. W. Stayman
Lewisburg	Greenbrier College	F. W. Thompson
Wisconsin		
Madison	Edgewood Junior College of the Sacred Heart	Sister Marie Aileen
Milwaukee	Concordia College	M. J. F. Albrecht
Mt. Calvary	St. Lawrence Junior College	Alexis Gore
St. Nazianz	Salvatorian Seminary	B. Friedrich

Section XII

HEADS OF PRIVATE SCHOOLS

City	Institution	Head
Alabama		
Anniston	Alabama Military Institute	E. B. Fishburne
Birmingham	The Simpson School	J. M. Malone
Fairhope	School of Organic Education	Marietta Johnson
Mobile	University Military School	William S. Pape
Thorsby	Thorsby Institute	Helen C. Jenkins
California		
Atascadero	Moran School for Boys	Frank G. Moran
Berkeley	Anna Head School	Mary E. Wilson
Beverly Hills	Berkeley Hall School	Lelia L. Cooper
Claremont	Webb School of California	Thompson Webb
Culver City	Pacific Military Academy	Harry H. Culver
La Jolla	The Bishop's School	Caroline S. Cummins
Los Angeles	The Harvard School	Robert B. Gooden
Los Angeles	The Marlborough School	Ada S. Blake
Los Angeles	Urban School for Boys, Ltd.	P. G. McDonnell
Los Angeles	Westlake School for Girls	Frederica de Laguna
Los Gatos	Montezuma Mountain School	E. A. Rogers
Palo Alto	Castilleja School	Mary I. Lockey
Palo Alto	Menlo School	Lowry S. Howard
Pasadena	Westridge School	Mary L. Ranney
San Diego	San Diego Army & Navy Academy	Thomas A. Davis
San Francisco	Miss Burke's School	Barbara Burke
San Francisco	Drew School	John S. Drew
San Francisco	Sarah Dix Hamlin School	Mrs. E. B. Stanwood
San Rafael	San Rafael Military Academy	A. L. Stewart
San Rafael	The Tamalpais School	Frederick J. Daly
Santa Barbara	Santa Barbara Girls School	E. Gertrude Gogin
Colorado		
Colorado Springs	Fountain Valley School	Francis Mitchell Froelicher
Denver	Kent School for Girls	Mary L. Rathvon
Connecticut		
Avon	Avon Old Farms	Percy G. Kammerer
Cheshire	Roxbury School	Arthur N. Sheriff
Clinton	Morgan School	James S. Guernsey
Farmington	Miss Porter's School	Robert Porter Keep
Greenwich	Brunswick School	Thomas C. Burton
Greenwich	The Edgewood School	Elizabeth R. Langley
Greenwich	Greenwich Academy	Ruth West Campbell
Greenwich	Rosemary Hall	C. Ruutz-Rees
Hartford	Kingswood School	George R. H. Nicholson
Hartford	Oxford School	Ruth E. Guernsey
Hartford	St. Thomas Preparatory Seminary	Maurice F. McAuliffe
Kent	Kent School	Frederick H. Sill
Lakeville	Hotchkiss School	George Van Santvoord
Meriden	Kimball Union Academy	William B. Brewster
Middlebury	Westover	Louise B. Dillingham
Milford	The Milford School	Laurence W. Gregory
New Haven	Collegiate School	Arthur Pite
New Haven	Mrs. Day's School	Mrs. Clive Day
New Haven	Hamden Hall Country Day School	E. Stanley Taylor
New Haven	Hopkins Grammar School	George B. Lovell
New London	Bulkeley School	Homer B. Underwood
New London	Williams Memorial Institute	Colin S. Buell
New Milford	Canterbury School	Nelson Hume
Norwalk	Hillside Country School	Margaret P. Brendlinger
Norwich	Norwich Free Academy	Henry A. Terrell
Pomfret	Pomfret School	Halleck Lefferts
Rowayton	The Thomas School	Mabel Thomas
Salisbury	Salisbury School	Emerson R. Quaile
Simsbury	Ethel Walker School	Ethel Walker Smith
Simsbury	Westminster School	Raymond B. McOrmond
South Kent	South Kent School	Samuel S. Bartlett
Stamford	The King School	V. A. Dwelle
Suffield	Suffield School	Brownell Gage
Wallingford	The Choate School	George C. St. John
Washington	The Gunnery School	Hamilton Gibson
Waterbury	St. Margaret's School	Alberta C. Edell
Watertown	The Taft School	Horace D. Taft
Windsor	The Loomis School	N. H. Batchelder
Winsted	The Gilbert School	Walter D. Hood
Delaware		
Middletown	St. Andrew's School	Walden Pell 2nd
Wilmington	Friends School	Wilmot R. Jones
Wilmington	Tower Hill School	Burton P. Fowler
District of Columbia		
Washington	Academy of the Holy Cross	Sister M. Remigius
Washington	Arlington School for Girls	Carrie Sutherlin
Washington	Chevy Chase School	Mrs. Frederic E. Farrington
Washington	Devitt School	J. F. Byerly
Washington	Emerson Institute	Winslow H. Randolph
Washington	Georgetown Preparatory School	Robert S. Lloyd
Washington	Georgetown Visitation Convent	Sister M. Sheesin
Washington	Gunston Hall	Mary L. Gildersleeve
Washington	The Holton-Arms School	Jessie M. Holton
Washington	Mt. Vernon Seminary	Jean Dean Cole
Washington	National Cathedral School	Mabel B. Turner
Washington	St. Albans	Albert H. Lucas
Washington	Sidwell's Friends School	Thomas W. Sidwell
Florida		
Jacksonville	The Bolles School	Roger M. Painter
Miami	The Cate School	W. B. Cate
Miami	Miss Harris' School	Julia F. Harris
Miami Beach	Coburn Country Day School	Nelson Coburn
St. Leo	St. Leo Preparatory	Francis Sadlier
St. Petersburg	Florida Military Academy	W. B. Mendels
Georgia		
Atlanta	North Avenue Presbyterian School	Thyrza S. Askew
Atlanta	Peacock School for Boys	D. C. Peacock
Atlanta	University School	W. E. Dendy
Atlanta	Washington Seminary	Llewellyn D. Scott
College Park	Georgia Military Academy	J. C. Woodward
Gainesville	Riverside Military Academy	Sandy Beaver
Mt. Zion	Mount Zion Seminary	Estella Searles Howard
Oxford	Emory University Academy	George S. Roach
Rome	Darlington School	Ernest L. Wright
Savannah	Pape School	Nina A. Pape
Illinois		
Abingdon	Illinois Military School	Clyde R. Terry
Aledo	Roosevelt Military Academy	L. S. Stafford
Alton	Western Military Academy	R. L. Jackson
Chicago	Chicago Latin School	James O. Wood
Chicago	Faulkner School for Girls	Elizabeth Faulkner
Chicago	The Girls Latin School of Chicago	Elizabeth Singleton
Chicago	Harvard School for Boys	Charles E. Pence
Chicago	Loring School	Cecilia Russell
Chicago	Luther Institute	John C. Anderson
Chicago	Francis W. Parker School	Raymond W. Osborne
Chicago	Starrett School for Girls	Gerard T. Smith
Chicago	Stickney School	Stanley M. Durrant
Chicago	The University High School	Arthur K. Loomis
Elgin	Elgin Academy	Karl J. Stouffer
Evanston	Marywood School for Girls	Sister Superior
Evanston	Roycemore School	Rebecca S. Ashley
La Grange	Broadview Academy	A. J. Olson
Lake Forest	Ferry Hall	Eloise R. Tremain
Lake Forest	Lake Forest Academy	John W. Richards
Mooseheart	Mooseheart School	W. J. Leinweber
Morgan Park	Morgan Park Military Academy	Harry D. Abells
Onarga	Onarga Military School	J. E. Bittinger
Rock Island	Villa De Chantal	Sister Marie
Sycamore	St. Alban's School	Charles L. Street
Winnetka	The North Shore Country Day School	Perry D Smith
Indiana		
Culver	Culver Military Academy	L. R. Gignilliat
Howe	Howe School	Burrett B. Bouton
Iowa		
Dubuque	Columbia Academy	J. I. Patnode
Kansas		
Salina	St. John's Military School	R. H. Mize
Kentucky		
Lexington	Sarye School for Girls	J. C. Hanley
Louisville	Louisville Collegiate School	Marjorie Hiscox
Lyndon	Kentucky Military Institute	Charles B. Richmond
Shelbyville	Science Hill School	Clara Martin Poynter

City	Institution	Head
Louisiana		
New Orleans	Gilbert Academy	Margaret Davis Bowen
New Orleans	Louise S. McGehee School	Nar W. Taylor
New Orleans	Metairie Park Country Day School	Ralph F. Boothby
New Orleans	Isidore Newman School	C. C. Henson
Maine		
Bethel	Gould Academy	Frank E. Hanscom
Bridgton	Bridgton Academy	H. H. Sampson
Dover-Foxcroft	Foxcroft Academy	Frank G. Stone
Fryeburg	Fryeburg Academy	Elroy O. LaCasce
Good Will	Good Will Homes & Schools	Walter P. Hinckley
Hebron	Hebron Academy	Ralph L. Hunt
Houlton	Ricker Classical Institute	R. M. Hayes
Kents Hill	Kents Hill Seminary	Edward W. Hincks
Pittsfield	Maine Central Institute	Edwin M. Purinton
Portland	The Waynflete School	Barbara R. Woodruff
Saco	Thornton Academy	E. R. Woodbury
South Berwick	Berwick Academy	Ercell M. Gordon
Vassalboro	Oak Grove School	Robert E. Owen
Waterville	Coburn Classical Institute	Hugh A. Smith
Maryland		
Baltimore	The Boys' Latin School	Frederick A. Hahn
Baltimore	The Byrn Mawr School	Margaret Hamilton
Baltimore	Friends School	Edwin C. Zavitz
Baltimore	The Gilman Country School	E. Boyd Morrow
Baltimore	The Girls' Latin School	Nellie M. Wilmot
Baltimore	Loyola High School	John S. Duston
Baltimore	Mt. St. Joseph College	Brother Nathanael
Baltimore	Notre Dame of Maryland High School	Sister Mary Coeline
Baltimore	The Park School	Hans Froelicher, Jr.
Baltimore	Roland Park Country School	Elizabeth M. Castle
Catonsville	St. Timothy's School	Louisa M. Fowler
Charlotte Hall	Charlotte Hall School	H. F. Crowson
Forest Glen	National Park Seminary	James E. Ament
Glencoe	Oldfields School, Inc.	Duncan McCulloch
McDonogh	McDonogh School	Louis E. Lamborn
Port Deposit	The Tome School	Charles J. Keppel
Reisterstown	The Hannah More Academy	Laura Fowler
St. James	St. James School	Adrian H. Onderdonk
Severna Park	Severn School	Holland M. Teel
Massachusetts		
Andover	Abbot Academy	Bertha Bailey
Andover	Phillips Academy	Claude Moore Fuess
Ashburnham	Cushing Academy	Clarence P. Quimby
Belmont	Belmont Hill School	Thomas R. Morse
Boston	The Brimmer School	Mabel Cummings
Boston	Boston Academy of Notre Dame	Sister Frances
Boston	Chauncy Hall School	Franklin T. Kurt
Boston	Erskine School	Euphemia E. McClintock
Boston	Huntington School for Boys	Charles H. Sampson
Boston	The May School, Inc.	Mrs. Chas. H. Haskins
Boston	The Winsor School	Katherine Lord
Brookline	Choate School	Augusta Choate
Brookline	The Rivers School	Clarence B. Allen
Cambridge	The Browne & Nichols School	Roger T. Twitchell
Cambridge	The Buckingham School	Marian W. Vaillant, Acting
Cambridge	Manter Hall School	Charles M. Underwood
Cambridge	New Preparatory School	Ernest Benshimol
Chestnut Hill	The Beaver Country Day School	Eugene R. Smith
Concord	Concord Academy	Elsie G. Hobson
Concord	Middlesex School	Frederick Winsor
Danvers	St. John's Preparatory School	Brother Aubert
Dedham	Noble & Greenough School	Charles Wiggins
Deerfield	Deerfield Academy	Frank L. Boyden
Easthampton	Williston Academy	Archibald V. Galbraith
Franklin	Dean Academy	Earle S. Wallace
Groton	Groton School	Endicott Peabody
Groton	Lawrence Academy	Fred Clifton Gray
Hingham	Derby Academy	George F. Cherry
Lowell	Rogers Hall	Katharine W. McGay
Marion	Tabor Academy	Walter H. Lillard
Milton	Milton Academy	Wm. L. W. Field
Mt. Hermon	The Mount Hermon School	David R. Porter
Natick	Walnut Hill School	Hester R. Davies
Newton	The Country Day School for Boys of Boston	W. Linwood Chase
North Andover	Brooks School	Frank D. Ashburn
Northfield	Northfield Seminary	Mira P. Wilson
Norton	House in the Pines	Gertrude B. Cornish
Pittsfield	Miss Hall's School	Mira H. Hall
Sheffield	Berkshire School	Seaver B. Buck
Southboro	St. Mark's School	Francis Parkman
South Braintree	Thayer Academy	Stacy B. Southworth
South Byfield	Governor Dummer Academy	Edward W. Eames
Wellesley	Academy of the Assumption	Sister Maris Stella
Wellesley	Dana Hall School	Dorothy Waldo
West Bridgewater	Howard Seminary	Lynn H. Harris
Weston	The Cambridge School	John R. P. French
West Roxbury	Roxbury Latin School	George N. Northrop
Wilbraham	Wilbraham Academy	Charles L. Stevens
Worcester	Bancroft School	Hope Fisher
Worcester	Worcester Academy	Harold H. Wade
Michigan		
Detroit	The Liggett School	Katharine Ogden
Detroit	Miss Newman's School	Mary Newman
Grosse Pointe	Detroit University School	Daniel H. Fletcher
Minnesota		
Faribault	St. Mary's Hall	Katharine Caley
Faribault	Shattuck School	C. W. Newhall
Minneapolis	The Blake School	Eugene C. Alder
Minneapolis	Minnehaha Academy	J. S. Peterson, Acting
Minneapolis	Northrop Collegiate School	Ethel M. Spurr
Owatonna	Pillsbury Academy	Milo B. Price
St. Paul	St. Paul Academy	John DeQ. Briggs
St. Paul	The Summit School	Sarah Converse
Mississippi		
Blue Mountain	Mississippi Heights Academy	
Gulfport	Gulf Coast Military Academy	Nat Owen
Port Gibson	Chamberlain-Hunt Academy	J. W. Kennedy
Missouri		
Boonville	Kemper Military School	A. M. Hitch
Clayton	John Burroughs School	Leonard D. Haertter
Clayton	Chaminade College Academy	Sylvester P. Juergens
Columbia	University High School	C. H. Butler
Kansas City	The Barstow School	M. Mercer Kendig
Kansas City	The Pembroke Country Day School	Howard A. Jones
Lexington	Wentworth Military Academy	J. M. Sellers
Mexico	Missouri Military Academy	Charles R. Stribling
Point Lookout	The School of the Ozarks	Carl Cave
St. Louis	Hosmer Hall	Katherine F. Roberts
St. Louis	Mary Institute	Charles H. Garrison
St. Louis	The Principia	William E. Morgan
St. Louis	St. Louis Country Day School	Robert H. B. Thompson
Nebraska		
Omaha	Brownell Hall	Abba W. Bowen
New Hampshire		
Andover	Proctor Academy	Lyle H. Farrell, Acting
Center Strafford	Austin-Cate Academy	Clarence Cummings
Concord	St. Paul's School	Samuel S. Drury
Derry	Pinkerton Academy	John H. Bell
Exeter	Phillips Exeter Academy	Lewis Perry
Exeter	Robinson Seminary	James A. Pirnie
Kingston	Sanborn Seminary	Clarence E. Amstutz
New Hampton	New Hampton	Frederick Smith
Tilton	Tilton School	James E. Coons
Wolfeboro	Brewster Free Academy	Walter G. Greenall Jr.
New Jersey		
Blairstown	Blair Academy	Charles H. Breed
Bordentown	Bordentown Military Institute	
Burlington	St. Mary's Hall	Edith M. Weller
Convent	Academy of St. Elizabeth	Sister Marie Josephine
Elizabeth	Pingry School	Charles B. Newton
Elizabeth	The Vail-Deane School	Esther L. Swenson
Englewood	Dwight School	Frances Leggett
Essex Falls	Kingsley School	Walter D. Gerken
Gladstone	St. Bernard's School	H. D. Nicholls
Hackettstown	Centenary Collegiate Institute	Robert J. Trevorrow
Hightstown	Peddie School	Wilbur E. Saunders
Hoboken	Stevens Hoboken Academy	B. F. Carter
Jersey City	Bergen School for Girls	Louise W. Moora
Lakewood	Newman School	William M. Ayar
Lawrenceville	The Lawrenceville School	Allan V. Heely
Montclair	The Kimberley School	Mary K. Waring
Montclair	Montclair Academy	Walter D. Head
Moorestown	Moorestown Friends School	Chester L. Reagan
Morristown	Morristown School	George H. Tilghman
Newark	Newark Academy	Clinton F. Zerweck
Newark	Newark Preparatory School	Leon Terry
New Brunswick	The Rutgers Preparatory School	Philip M. B. Boocock
Orange	Miss Beard's School	Lucie C. Beard

City	Institution	Head
New Jersey—*Cont.*		
Orange	Carteret Academy	George G. Grim
Orange	Dearborn-Morgan School	George L. Shelley
Pennington	Pennington School	Francis Harvey Green
Pine Beach	Admiral Farragut Academy	S. S. Robinson
Plainfield	Wardlaw School	C. D. Wardlaw
Princeton	Miss Fine's School	Mrs. B. L. Earle
Princeton	Hun School of Princeton	John G. Hun
Summit	Kent Place School	Harriett L. Hunt
Wenonah	Wenonah Military Academy	Charles M. Lorence
New Mexico		
Roswell	New Mexico Military Institute	D. C. Pearson
New York		
Albany	Academy of the Holy Name	
Albany	The Albany Academy	Islay F. McCormick
Albany	Albany Academy for Girls	Margaret Trotter
Albany	St. Agnes School	Blanche Pittman
Bronxville	Brantwood Hall	Mary T. Maine
Brooklyn	Adelphi Academy	William Slater
Brooklyn	Berkeley Institute	Ina C. Atwood
Brooklyn	Brooklyn Academy	Charles W. Cortright
Brooklyn	Brooklyn Friends School	Wayne L. Douglas
Brooklyn	Brooklyn Preparatory School	John H. Klocke
Brooklyn	Colby Academy, Inc.	Walter S. Meyer
Brooklyn	Flatbush School	Dwight R. Little
Brooklyn	Polytechnic Preparatory Country Day School	Joseph Dana Allen
Brooklyn Heights	The Packer Collegiate Institute	John H. Denbigh
Buffalo	The Buffalo Seminary	Gertrude Angell
Buffalo	The Franklin School	Bertha A. Keyes
Buffalo	Nichols School	Henry G. Gilland
Carmel	Drew Seminary for Young Women	Herbert Wright
Cazenovia	The Cazenovia Seminary	Harold W. Hebblethwaite
Cooperstown	The Knox School	Mrs. E. Russell Houghton
Cornwall	New York Military Academy	Milton E. Davis
Dobbs Ferry	The Masters School	Evelina Pierce
Forest Hills	Kew-Forest School	Louis D. Marriott
Garden City	Cathedral School of St. Mary	Miriam A. Bytel
Garden City	St. Paul's School	Walter R. Marsh
Glens Falls	Glens Falls Academy	J. Thacher Sears
Jackson Heights	Garden Country Day School	O. P. Flower
Lake Placid	Northwood School	Ira A. Flinner
Lakemont	Palmer Institute-Starkey Seminary	James P. Long
Lima	Genesee Wesleyan Seminary	A. Talmage Schulmaier
Locust Valley	Friends Academy	Alexander M. Blackburn
Manlius	Manlius School	Guido F. Verbeck
Millbrook	The Bennett School	Courtney Carroll
Montour Falls	Cook Academy	Bert C. Cate
New York	Academy Mount Saint Vincent	Frances E. Marra
New York	All Hallows Institute	P. D. McCarthy
New York	The Barnard School for Boys	William L. Hazen
New York	The Barnard School for Girls	Theodore E. Lyon
New York	The Berkeley-Irving School	J. Clark Read
New York	Birch Wathen School	Louise Birch
New York	The Brearley School	Millicent Carey McIntosh
New York	The Calhoun School	Mary E. Calhoun
New York	The Chapin School, Ltd.	Ethel Stringfellow
New York	Columbia Grammar School	Frederic A. Alden
New York	Collegiate School	Wilson Parkhill
New York	Dwight School	Ernest Greenwood
New York	Franklin School	Clifford W. Hall
New York	Friends Seminary	Henry L. Messner
New York	The Lenox School	Olivia Green
New York	Lincoln School of Teachers College	Jesse P. Newlon
New York	Horace Mann School	Rollo G. Reynolds
New York	Horace Mann School for Boys	Charles C. Tillinghast
New York	McBurney School	Thomas Hemenway
New York	The Nightingale-Bamford School	Frances N. Nightingale
New York	Rhodes School	David Goodman
New York	The Riverside School	Margaret E. Wells
New York	St. Agatha	Muriel Bowden
New York	St. Ann's Academy for Boys	Brother Charles
New York	The Scudder School	Mrs. Myron T. Scudder
New York	The Spence School	Valentine L. Chandor
New York	Trinity School	Lawrence T. Cole
New York	The Walden School	Elizabeth Goldsmith
Oakdale	La Salle Military Academy	Brother Ambrose
Pawling	Pawling School	R. J. Shortlidge
Peekskill	The Peekskill Military Academy	John C. Bucher
Peekskill	St. Mary's School	Sister Mary Regina
Poughkeepsie	Oakwood School	William J. Reagan
Poughkeepsie	Putnam Hall	Ellen C. Bartlett
Riverdale	Riverdale Country School	Frank S. Hackett
Rochester	Allendale School	Barclay H. Farr
Rochester	Columbia Preparatory School	Caroline Milliman
Rochester	The Harley School	Louise M. Sumner
Rye	Rye Country Day School	Morton Snyder
Scarborough	Scarborough School	F. Dean McClusky
Snyder	The Park School of Buffalo	Wendell A. Norvell
Staten Island	Notre Dame Academy	Sister St. Margaret
Staten Island	Staten Island Academy	Stephen J. Botsford
Stony Brook	The Stony Brook School	Frank E. Gaebelein
Tarrytown	The Hackley School	Walter B. Cage
Tarrytown	Irving School	C. W. Olson
Tarrytown	Marymount School	Mother M. Therese Dalton
Troy	La Salle Institute	Brother Raymond
Troy	Emma Willard School	Eliza Kellas
Utica	Utica Country Day School	Raymond B. Johnson
Woodmere	Woodmere Academy	Horace M. Perry
North Carolina		
Asheville	Asheville School	Howard Bement
Asheville	St. Genevieve-of-the-Pines	Mother Lorin
Beaufort	St. Paul's School	Mrs. N. P. Geffroy
Hendersonville	Fassifern School	Joseph R. Sevier
Oak Ridge	Oak Ridge Military Institute	T. O. Wright
Star	Country Life Academy	E. F. Green
Washington	Washington Collegiate Institute	Maynard O. Fletcher
Winston Salem	Salem Academy	Mary A. Weaver
North Dakota		
Fargo	Oak Grove Seminary	J. E. Fossum
Ohio		
Akron	Old Trail School	Eugene M. Hinton
Barnesville	Friends Boarding School	Blanche E. Sheffield
Cincinnati	Academy Mount St. Joseph	Sister Dorothea
Cincinnati	College Preparatory School	Mary Harlan Doherty
Cincinnati	University School	
Cleveland	Hathaway-Brown School	Mary E. Raymond
Cleveland	The University School	Harry A. Peters
Columbus	The Columbus Academy	Frank P. R. Van Syckel
Columbus	The Columbus School for Girls	Grace I. J. McClure
Germantown	Miami Military Institute	Orvon G. Brown
Hudson	Western Reserve Academy	Joel B. Hayden
Mt. Vernon	Mt. Vernon Academy	Ellsworth M. Andross
Reading	Mount Notre Dame Academy	Sister Genevieve Marie
Shaker Heights	Laurel School	Edna F. Lake
Toledo	Maumee Valley Country Day School	Leslie Leland
Oregon		
Gaston	Laurelwood Academy	H. R. Miller
Portland	The Catlin School	Jessie T. Powers
Portland	Hill Military Academy	Joseph A. Hill
Pennsylvania		
Allentown	Allentown Preparatory School	Louis F. Hackemann
Birmingham	The Birmingham School	Thomas C. Grier
Bryn Mawr	The Baldwin School	Elizabeth F. Johnson
Bryn Mawr	The Shipley School	Alice G. Howland
Forty Fort	The Wilkes-Barre Institute	Anna M. Olcott
George School	George School	George A. Walton
Harrisburg	Harrisburg Academy & Junior College	Arthur E. Brown
Haverford	Haverford School	Edwin M. Wilson
Hollidaysburg	Highland Hall	Elizabeth G. Baldwin
Kingston	Wyoming Seminary	E. L. Sprague
Lancaster	Franklin & Marshall Academy	E. M. Hartman
Lancaster	The Shippen School for Girls	Elizabeth Ross
Latrobe	St. Xavier's Academy	Sister M. Catherine
Mercersburg	The Mercersburg Academy	Boyd Edwards
New Bloomfield	Carson Long Institute	Edward L. Holman
Oak Lane	Oak Lane Country School	J. S. Butterweck
Overbrook	The Episcopal Academy	Greville G. Haslam
Pennsburg	Perkiomen School	Clarence E. Tobias, Jr.
Philadelphia	Carson College for Orphan Girls	Elsa Ueland
Philadelphia	Chestnut Hill Academy	G. H. Fall
Philadelphia	Convent of the Sacred Heart	Mother M. Helen Lucas
Philadelphia	Friends Central School	Barclay L. Jones
Philadelphia	Friends Select School	Walter W. Haviland
Philadelphia	Germantown Academy	Samuel E. Osbourn
Philadelphia	Germantown Friends School	Stanley R. Yarnell
Philadelphia	The Lankenau School	E. F. Bachmann
Philadelphia	Mount St. Joseph Academy	Mother Directress
Philadelphia	The William Penn Charter School	Richard Knowles

City	Institution	Head
Pennsylvania —*Cont.*		
Philadelphia	Miss Sayward's School	Anne Cutter Coburn
Philadelphia	Springside School	Mrs. Samuel H. Paul
Philadelphia	Stevens School	Helen L. Church
Philadelphia	Temple University High School	Charles E. Metzger
Pittsburgh	Arnold School	Roger B. Merriman, Jr.
Pittsburgh	The Ellis School	Sara Frazer Ellis
Pittsburgh	Shady Side Academy	Harold A. Nomer
Pittsburgh	Thurston Preparatory School	Marjorie I. Pratt
Pittsburgh	The University School	Guy H. Baskerville
Pittsburgh	The Winchester School	Mary A. G. Mitchell
Pottstown	The Hill School	James I. Wendell
Rydal	Ogontz School	Abby A. Sutherland
Saltsburg	Kiskiminetas Springs School	W. H. MacColl
Susquehanna	Laurel Hill Academy	D. J. Bustin
Swarthmore	The Mary Lyon School	Haldy M. Crist
Wayne	Valley Forge Military Academy	Milton G. Baker
Westtown	Westtown School	James F. Walker
Williamsport	Williamsport Dickinson Seminary	John W. Long
Wynnewood	The Agnes Irwin School	Bertha M. Laws
Wynnewood	Montgomery School	Gibson Bell
York	York Collegiate Institute	Lester F. Johnson
Rhode Island		
East Greenwich	East Greenwich Academy	Ira W. LeBaron
Newport	St. George's School	J. Vaughan Merrick
Portsmouth	Portsmouth Priory School	J. Hugh Diman
Providence	Lincoln School	Frances E. Wheeler
Providence	The Moses Brown School	L. Ralston Thomas
Providence	The Mary C. Wheeler School	Mary Helena Dey
South Carolina		
Aiken	Fermata	F. A. M. Tabor
Bamberg	Carlisle School	James F. Risher
Charleston	Ashley Hall	Mary V. McBee
Greenwood	Bailey Military Institute	James D. Fulp
Tennessee		
Baxter	Baxter Seminary	Harry L. Upperman
Bell Buckle	The Webb School	W. R. Webb, Jr.
Butler	Watauga Academy	C. A. Todd
Chattanooga	The Baylor School	Herbert B. Barks
Chattanooga	The McCallie School	S. J. McCallie
Columbia	Columbia Military Academy	D. M. Myers
Lebanon	Castle Heights Military Academy	Harry L. Armstrong
Memphis	Miss Hutchison's School	Mary G. Hutchison
Nashville	Peabody Demonstration School	W. H. Yarbrough
Petersburg	Morgan School	R. Kenneth Morgan, Jr.
Pleasant Hill	Pleasant Hill Academy	Oscar M. Fogle
Sewanee	Sewance Military Academy	William R. Smith
Sweetwater	Tennessee Military Institute	C. R. Endsley
Texas		
Bryan	Allen Academy	N. B. Allen
Dallas	The Miss Hockaday School for Girls	Ela Hockaday
Dallas	Terrill Preparatory & Junior College	S. M. Davis
Houston	Kinkaid School	Margaret H. Kinkaid
Laredo	Holding Institute	Carmen Blessing
San Antonio	St. Mary's Hall	Ruth Coit
San Antonio	Texas Military Institute	W. W. Bondurant
San Marcos	San Marcos Academy	R. M. Cavness
Vermont		
Lyndon Center	Lyndon Institute	O. D. Mathewson
Manchester	Burr & Burton Seminary	Ralph E. Howes
Montpelier	Montpelier Seminary	Chas. C. Chayer
St. Johnsbury	St. Johnsbury Academy	Stanley R. Oldham
Saxtons River	Vermont Academy	Lawrence C. Leavitt
Virginia		
Alexandria	The Episcopal High School	A. R. Hoxton
Alexandria	St. Agnes School for Girls	Mrs. G. C. Macan
Chatham	Chatham Hall	Edmund J. Lee
Chatham	Hargrave Military Academy	Aubrey H. Camden
Danville	Virginia Presbyterian School	William M. Kemper
Ferrum	Ferrum Training School	J. A. Chapman
Fork Union	Fork Union Military Academy	Nathaniel J. Perkins
Fort Defiance	Augusta Military Academy	C. S. Roller
Front Royal	Randolph-Macon Academy	John C. Boggs
Greenway	The Madeira School	Mrs. David Wing
Grundy	Grundy Presbyterian School	Frank B. Clark
Lynchburg	Virginia Episcopal School	Oscar deW. Randolph
Middleburg	Foxcroft School	Charlotte H. Noland
Richmond	The Collegiate School	Mary D. Ruffin
Richmond	McGuire's University School	John P. McGuire
Staunton	Staunton Military Academy	Robert T. Hill
Staunton	Stuart Hall	Ophelia S. T. Carr
Warrenton	Warrenton Country School	Lea M. Bouligny
Waynesboro	Fairfax Hall	John N. Maxwell
Waynesboro	Fishburne Military School	M. H. Hudgins
Westhampton	St. Catherine's School	Louisa de B. B. Brackett
Westhampton	St. Christopher's School	C. G. Chamberlayne
Woodberry Forest	Woodberry Forest School	J. Carter Walker
Woodstock	Massanutten Academy	H. J. Benchoff
Washington		
Seattle	Helen Bush School	Helen T. Bush
Seattle	Saint Nicholas School	Fanny C. Steele
Tacoma	The Annie Wright Seminary	Sallie E. Wilson
West Virginia		
Lewisburg	Greenbrier Military School	H. B. Moore
Wisconsin		
Delafield	St. John's Military Academy	Roy F. Farrand
Kenosha	Kemper Hall	Sister Mary Ambrose
Lake Geneva	Northwestern Military & Naval Academy	R. P. Davidson
Milwaukee	Milwaukee Country Day School	A. Gledden Santer
Milwaukee	Milwaukee-Downer Seminary	Helen K. Burtt
Milwaukee	Milwaukee University School	Frank L. Spigener
Prairie du Chien	Campion High School	J. C. Friedl

Section XIII

SUPERINTENDENTS OF SCHOOLS IN PLACES OF 5,000 POPULATION AND OVER

In the following list are included all places which are known to have a superintendent of schools and which, according to the 1930 Federal Census, have a population of 5,000 or over. These include incorporated cities, towns, boroughs and villages, unincorporated towns (in New England), and townships classified as urban by the Bureau of the Census. The names of the superintendents have been revised to November, 1935, and in some cases more recently.

REFERENCES

(a) County superintendent. (b) Parish superintendent.

City	Superintendent
Alabama	
Andalusia	C. L. Martin
Anniston	C. C. Moseley
Bessemer	J. E. Bryan
Birmingham	C. B. Glenn
Decatur	W. W. Benson
Dothan	Bruce Flurry
Eufaula	T. G. Wilkinson
Fairfield	B. B. Baker
Florence	J. W. Powell
Gadsden	C. A. Donehoo
Homewood	(No local board of education)
Huntsville	W. G. Hamm
Jasper	G. T. Patrick
Lanett	Taylor H. Kirby
Mobile	W. C. Griggs
Montgomery	W. R. Harrison
Opelika	R. B. Mardre
Phenix City	L. P. Stough
Selma	P. M. Munro
Sheffield	L. E. Creel
Talladega	Ben. S. Copeland
Tarrant	W. A. Parker
Troy	L. D. Bynum
Tuscaloosa	J. M. Burnett
Arizona	
Bisbee	R. E. Souers
Douglas	J. E. Carlson, Jr.
Globe	H. E. Stevenson
Miami	Ivan P. Hostetter
Nogales	A. J. Mitchell
Phoenix	John D. Loper
Prescott	Donald Sheldon
Tucson	C. E. Rose
Arkansas	
Blytheville	W. D. McClurkin
Camden	F. W. Whiteside
Conway	B. A. Short
El Dorado	J. G. McClurkin
Fayetteville	Frank S. Root
Fort Smith	J. W. Ramsey
Helena	J. F. Wahl
Hope	Miss Beryl Henry
Hot Springs National Park	Harvey H. Haley
Jonesboro	Fred Keller
Little Rock	R. C. Hall
Malvern	B. J. Glover
No. Little Rock	T. H. Alford
Paragould	C. S. Blackburn
Pine Bluff	J. R. Allen
Russellville	E. W. Bass
Texarkana	P. N. Bragg
Van Buren	D. M. Riggin
California	
Alameda	Wm. G. Paden
Albany	John Franklin West
Alhambra	Geo. E. Bettinger
Anaheim	M. A. Gauer
Arcadia	Elmer E. Westerhouse
Bakersfield	L. E. Chenoweth
Berkeley	Lewis W. Smith
Beverly Hills	E. J. Hummel
Brawley	Geo. K. Anderson
Burbank	B. F. Enyeart
Burlingame	L. D. Henderson
Calexico	J. W. Lawson
Chico	F. L. Cummings
Colton	J. H. Waldron
Compton	Ardelle B. Tibbey
Corona	Frank E. Bishop
Coronado	F. A. Boyer (Elementary) J. Leslie Cutler (High)
Culver City	Bessie O. Brown
Daly City	R. L. Crane
El Centro	Guy A. Weakley
Eureka	G. B. Albee
Fresno	O. S. Hubbard
Fullerton	R. E. Green
Glendale	R. D. White
Hanford	C. E. Denham
Hawthorne	Herman A. Buckner
Hayward	Robert M. Reid
Inglewood	George M. Green (High) Robert E. Cralle (Elementary)
Lodi	LeRoy Nichols
Long Beach	Will French
Los Angeles	F. A. Bouelle
Lynwood	Coral F. Mercer
Martinez	Forrest V. Routt
Marysville	W. A. Kynoch
Merced	W. M. Smith (Elementary) A. W. Meany (High)
Modesto	J. H. Bradley
Monrovia	J. Warren Ayer
Montebello	Mark R. Jacobs
Monterey	J. R. Croad (Elementary) J. R. McKillop (High)
Napa	D. J. Herry
National City	Fred M. Tonge
Oakland	E. W. Jacobsen
Ontario	C. W. Randall
Orange	G. C. Sherwood
Oxnard	R. B. Haydock
Pacific Grove	R. H. Down
Palo Alto	A. C. Barker
Pasadena	J. A. Sexson
Petaluma	David M. Durst
Piedmont	Harry W. Jones
Pittsburg	F. S. Ramsdell
Pomona	Emmett Clark
Porterville	C. E. Bigham
Redlands	H. G. Clement
Redondo Beach	F. F. Martin (Elementary) Aileen S. Hammond (High)
Redwood City	John Gill
Richmond	W. T. Helms
Riverside	Ira C. Landis
Roseville	W. T. Eich (Elementary) J. W. Hanson (High)
Sacramento	C. C. Hughes
Salinas	R. D. Case
San Bernardino	Albert D. Graves
San Diego	Will C. Crawford
San Francisco	Edwin A. Lee
San Gabriel	R. B. Walter
San Jose	W. L. Bachrodt
San Leandro	Andrew J. Cartwright
San Luis Obispo	Charles E. Teach
San Mateo	George W. Hall (Elementary) Homer Martin (High)
San Rafael	O. R. Hartzell
Santa Ana	Frank A. Henderson
Santa Barbara	Curtis E. Warren
Santa Clara	S. J. Brainerd
Santa Cruz	C. R. Holbrook
Santa Maria	Robert Bruce (Elementary) Andrew P. Hill, Jr. (High)
Santa Monica	Percy R. Davis
Santa Paula	George A. Bond (Elementary) F. M. Eakin (High)
Santa Rosa	Jerome O. Cross
South Pasadena	George C. Bush
South San Francisco	A. C. Kleemeyer (Elementary) Guy Roney (High)
Stockton	Ansel S. Williams
Taft	James A. Joyce
Tulare	W. B. Knokey
Vallejo	Elmer L. Cave
Ventura	E. L. Van Dellen
Visalia	DeWitt Montgomery
Watsonville	T. S. MacQuiddy
Whittier	Will Wiley (Elementary) D. A. Stouffer (High)
Woodland	T. L. Whitehead
Colorado	
Alamosa	G. P. Young
Boulder	Virgil M. Rogers
Canon City	L. L. Beahm

City	Superintendent
Colorado Springs	H. M. Corning
Denver	A. L. Threlkeld
Durango	Emory E. Smiley
Englewood	R. D. Jenkins
Fort Collins	Ward I. Miller
Grand Junction	R. E. Tope
Greeley	Hubert D. Eldridge
La Junta	G. T. Wilson
Longmont	Kent L. Sanborn
Loveland	R. W. Truscott
Pueblo	District No. 1, J. H. Risley District No. 20, J. F. Keating
Salida	L. D. Hightower
Sterling	R. R. Knowles
Trinidad	William R. Ross
Walsenburg	S. M. Andrews
Connecticut	
Ansonia	John J. Stevens
Bridgeport	Worcester Warren
Bristol	Karl A. Reiche
Danbury	Harold F. Dow
Darien	Edward H. Fuller
Derby	Richard T. Tobin
E. Hartford	P. S. Barnes
E. Haven	W. E. Gillis
Enfield	E. H. Parkman
Fairfield	A. M. McCullough
Glastonbury	Francis S. Knox
Greenwich	Edwin C. Andrews
Griswold	Ernest Lake
Hamden	Margaret L. Keefe
Hartford	Fred D. Wish, Jr.
Killingly	W. E. Parker
Manchester	Arthur H. Illing
Meriden	Nicholas Moseley
Middletown	Fred W. Shearer
Middletown (twn)	Van Buren Moody
Milford	C. W. Maddocks
Naugatuck	H. E. Chittenden
New Britain	S. H. Holmes
New Haven	John C. McCarthy
New London	Warren A. Hanson
Norwalk	Philip A. Jakob
Norwich	E. J. Graham
Plainfield	J. L. Chapman
Plainville	J. Wendell Yeo
Plymouth	H. S. Fisher
Putnam	Carl M. Diefenbach
Seymour	R. C. Clark
Shelton	Harry E. Fowler
Southington	William Strong
Stafford	Earl M. Witt
Stamford	Leon C. Staples
Stratford	E. Ward Ireland
Torrington	G. J. Vogel
Vernon	H. O. Clough
Wallingford	H. M. Jeffords
Waterbury	Thomas J. Condon
Watertown	G. C. Swift
West Hartford	Lloyd H. Bugbee
West Haven	Seth G. Haley
Westport	Heath E. White
Wethersfield	Wilson Greer
Winchester	L. R. McKusick
Windham	Egbert A. Case
Windsor	Earle S. Russell
Delaware	
Wilmington	S. M. Stouffer
District of Columbia	
Washington	Frank W. Ballou
Florida	
Bartow	C. I. Hollingsworth (a)
Bradenton	Jessie P. Miller (a)
Clearwater	Geo. P. Hoffman (a)
Coral Gables	Charles M. Fisher (a)
Daytona Beach	G. W. Marks (a)
Deland	G. W. Marks (a)
Fort Lauderdale	Ulric J. Bennett (a)
Fort Myers	Harry F. Hendry (a)
Gainesville	Horace F. Zetrouer (a)
Jacksonville	R. C. Marshall (a)
Key West	M. E. Russell (a)
Lakeland	C. I. Hollingsworth (a)
Lake Worth	J. A. Youngblood (a)
Miami	Charles M. Fisher (a)
Miami Beach	Charles M. Fisher (a)
Ocala	Don T. Mann (a)
Orlando	Judson B. Walker (a)
Palatka	L. S. Barstow (a)
Panama City	A. L. Hardy (a)
Pensacola	J. H. Varnum (a)
Plant City	E. L. Robinson (a)
River Junction	C. H. Gray (a)
St. Augustine	D. D. Corbett (a)
St. Petersburg	Geo. P. Hoffman (a)
Sanford	T. W. Lawton (a)
Sarasota	T. W. Yarbrough (a)
South Jacksonville	R. C. Marshall (a)
Tallahassee	F. S. Hartsfield (a)
Tampa	E. L. Robinson (a)
West Palm Beach	J. A. Youngblood (a)
Winter Haven	C. I. Hollingsworth (a)
Georgia	
Albany	R. E. Brooks
Americus	J. E. Mathis
Athens	B. M. Grier
Atlanta	W. A. Sutton
Augusta	S. D. Copeland
Bainbridge	E. G. Elcan
Brunswick	G. W. Wannamaker
Carrollton	M. C. Wiley
Cartersville	S. E. Alverson
Cedartown	J. E. Purks
Columbus	T. C. Kendrick
Cordele	D. H. Standard
Dalton	J. W. Williams
Decatur	Lamar Ferguson
Dublin	A. J. Hargrove
East Point	Paul West
Fitzgerald	W. W. Stancil
Gainesville	C. J. Cheves
Griffin	I. L. Fortney
Lagrange	F. F. Rowe
Macon	W. P. Jones
Marietta	C. A. Keith
Milledgeville	Col. J. H. Jenkins
Moultrie	J. L. Yaden
Newnan	C. B. Mathews
Rome	B. F. Quigg
Savannah	O. B. Strong
Thomasville	B. B. Broughton
Valdosta	A. G. Cleveland
Waycross	Ralph Newton
Idaho	
Boise	W. D. Vincent
Coeur d'Alene	G. O. Phippeny
Idaho Falls	W. W. Christensen
Lewiston	Glenn W. Todd
Nampa	J. E. Walsh
Pocatello	E. Norman Vaughn
Twin Falls	W. B. Smith
Illinois	
Alton	W. R. Curtis
Aurora	K. D. Waldo (East Side) C. E. Larson (West Side)
Batavia	H. C. Storm
Beardstown	W. L. Gard
Belleville	H. V. Calhoun
Belvidere	R. E. Garrett
Benton	Charles M. Johnson
Berwyn	William Hawkes (Dist. No. 98) E. W. Martin (Dist. No. 100)
Bloomington	James A. Lindsay
Blue Island	Walter A. Eggert
Brookfield	E. C. Cassady
Cairo	Leo C. Schultz
Calumet City	Eric E. Brown
Canton	Ben Kietzman
Carbondale	Raymond Hoffner
Centralia	R. V. Jordon
Champaign	V. L. Nickell
Charleston	U. B. Jeffries
Chicago	William J. Bogan
Chicago Heights	Ben A. Sylla
Cicero	G. A. Schwebel
Clinton	Arthur Verner
Collinsville	C. H. Dorris
Danville	C. E. Vance
Decatur	William Harris
De Kalb	F. W. Phillips
Des Plaines	E. R. Selleck
Dixon	A. H. Lancaster
Downers Grove	George De Wolf
Duquoin	Joe Strickler
East Moline	D. B. Hoffman
East Peoria	Paul L. Bolin
East St. Louis	D. Walter Potts
Edwardsville	E. L. Alexander
Elgin	Theodore Saam
Elmhurst	V. L. Beggs
Elmwood Park	George N. Wells
Evanston	J. R. Skiles (Dist. No. 75) David E. Walker (Dist. No. 76)
Forest Park	W. S. Dimmett
Freeport	B. F. Shafer
Galesburg	O. O. Young
Gillespie	J. W. White
Glencoe	Paul J. Misner
Glen Ellyn	S. A. Denison
Granite City	A. M. Wilson
Harrisburg	W. Russell Malan
Harvey	C. C. Thompson
Herrin	John R. Creek
Highland Park	R. H. Price (Dist. No. 107) Clark G. Wright (Dist. No. 108)
Hinsdale	Martin B. Travis
Hoopeston	W. R. Lowery
Jacksonville	R. O. Stoops
Johnston City	Earl E. Miller
Joliet	H. Ambrose Perrin
Kankakee	Irving Munson
Kewanee	Charles A. Bruner
La Grange	J. C. Davies
Lake Forest	J. E. Baggett
La Salle	J. B. McManus
Lawrenceville	M. N. Todd
Lincoln	D. F. Nichols
Litchfield	Allen J. Black
Lombard	Mrs. Ada Manning
Macomb	C. S. Chappelear
Madison	R. H. Hamilton
Marion	H. O. Belford
Mattoon	H. B. Black
Maywood	Eugene La Rowe
Melrose Park	Eugene La Rowe
Metropolis	C. J. Ramsay
Moline	E. P. Nutting
Monmouth	Roy Fetherston
Morris	B. R. Bowden
Mount Carmel	R. S. Condrey
Mount Vernon	H. E. Bosley
Murphysboro	Wm. H. Carruthers
Naperville	R. E. Beebe
Niles Center	R. E. Cotanche
Normal	Monroe Melton
North Chicago	F. E. De Yoe (Dist. No. 63) R. L. Newenham (Dist. No. 64)
Oak Park	W. J. Hamilton
Olney	C. T. Cramer
Ottawa	C. J. Byrne
Pana	H. L. Hart
Paris	John R. Moss
Park Ridge	Harry D. Winslow
Pekin	C. B. Smith
Peoria	E. C. Fisher
Peru	A. H. Karn
Pontiac	A. F. Speltz
Quincy	W. E. Nelson
River Forest	Ray E. Cheney
Riverside	L. J. Hawser
Rockford	W. W. Ankenbrand
Rock Island	S. H. Berg
St. Charles	G. E. Thompson
Savanna	W. D. Waldrip
Springfield	Frank T. Vasey
Spring Valley	James Nesti
Sterling	O. A. Fackler (Dist. No. 11) H. U. Challand (Dist. No. 10)
Streator	H. K. Whittier
Summit	Clarence Barrett

City	Superintendent
Taylorville	G. W. Wilcockson
Urbana	T. H. Cobb
Venice	J. H. Gore
Villa Park	H. E. Hinkel
Waukegan	John S. Clark
West Frankfort	C. A. Waller
Wheaton	K. K. Tibbetts
Wilmette	J. R. Harper
Winnetka	C. W. Washburne
Wood River	G. A. Smith
Woodstock	W. J. Calahan
Zion	Edgar T. Stephens
Indiana	
Anderson	Arthur Campbell
Auburn	H. L. McKenney
Bedford	Warren J. Yount
Bicknell	Harold Axe
Bloomington	H. E. Binford
Bluffton	O. M. Craig
Brazil	C. P. Keller
Clinton	E. C. Boyd
Columbus	Donald Du Shane
Connersville	E. C. Dodson
Crawfordsville	M. C. Darnall
Decatur	Walter J. Krick
East Chicago	Roy Feik
Elkhart	J. F. Wiley
Elwood	William F. Smith
Evansville	Ralph Irons
Fort Wayne	Merle Abbett (c)
Frankfort	M. N. O'Bannon
Franklin	R. W. Sheek
Gary	William A. Wirt
Goshen	J. W. Foreman
Greensburg	Elmer C. Jerman
Hammond	L. L. Caldwell
Hartford City	H. Paul Kelsay
Hobart	J. M. Sellers
Huntington	J. M. Scudder
Indianapolis	Paul C. Stetson
Jeffersonville	E. G. McCullum
Kendallville	H. M. Dixon
Kokomo	C. V. Haworth
Lafayette	Morris McCarty
La Porte	E. B. Wetherow
Lebanon	Paul Van Riper
Linton	T. J. Beecher
Logansport	W. L. Sprouse
Madison	E. O. Muncie
Marion	Elbert E. Day
Michigan City	Milo C. Murray
Mishawaka	P. C. Emmons
Mount Vernon	J. G. Turner
Muncie	D. W. Horton
New Albany	H. A. Buerk
New Castle	E. J. Llewelyn
Peru	J. P. Crodion
Plymouth	Ray Kuhn
Portland	J. C. Webb
Princeton	G. E. Derbyshire
Richmond	W. G. Bate
Rushville	L. A. Lockwood
Seymour	N. J. Lasher
Shelbyville	W. F. Loper
South Bend	Frank E. Allen
Sullivan	Dale C. Billman
Terre Haute	George C. Carroll
Valparaiso	Roy B. Julian
Vincinnes	V. L. Eikenberry
Wabash	O. J. Neighbours
Warsaw	James M. Leffel
Washington	N. E. Helderman
West Lafayette	F. A. Burtsfield
Whiting	W. W. Borden
Iowa	
Ames	M. G. Davis
Atlantic	J. P. Street
Boone	G. S. Wooten
Burlington	W. G. Brooks
Cedar Falls	J. H. Peet
Cedar Rapids	Arthur Deamer
Centerville	E. W. Fannon
Chariton	J. R. Cougill
Charles City	P. C. Lapham
Cherokee	N. D. McCombs
Clinton	C. W. Brown
Council Bluffs	J. A. True
Creston	Burton R. Jones
Davenport	Frank L. Smart
Des Moines	A. W. Merrill, Acting
Dubuque	E. D. Cline
Fairfield	W. G. Pence
Fort Dodge	K. D. Miller
Fort Madison	A. I. Tiss
Iowa City	I. A. Opstad
Keokuk	R. L. Reid
Marshalltown	W. F. Shirley
Mason City	R. B. Irons
Muscatine	H. Van Hettinga
Newton	B. C. Berg
Oelwein	G. B. Ferrell
Oskaloosa	R. B. Newman
Ottumwa	Roy F. Hannum
Perry	J. S. Vanderlinden
Red Oak	J. R. Inman
Shenandoah	W. Dean McKee
Sioux City	L. W. Feik
Spencer	H. J. Williams
Waterloo	J. M. Logan (East Side) Charles A. Kittrell (West Side)
Webster City	Burrus E. Beard
Kansas	
Abilene	F. C. Gardner
Arkansas City	C. E. St. John
Atchison	W. D. Wolfe
Chanute	L. H. Petit
Coffeyville	K. W. McFarland
Concordia	E. B. Allbaugh
Dodge City	A. G. Schroedermeier
Eldorado	J. F. Hughes
Emporia	W. M. Richards
Fort Scott	V. M. Liston
Garden City	Ira O. Scott
Great Bend	H. C. Scarborough
Hutchinson	J. W. Gowans
Independence	J. H. Clement
Iola	John Fleming
Junction City	W. A. Wood
Kansas City	F. L. Schlagle
Lawrence	C. E. Birch
Leavenworth	I. J. Bright
Liberal	N. B. Mahuron
Manhattan	W. E. Sheffer
McPherson	R. W. Potwin
Newton	J. B. Heffelfinger
Ottawa	G. H. Marshall
Parsons	R. H. Hughes
Pittsburg	M. M. Rose
Pratt	Amos W. Glad
Salina	W. S. Heusner
Topeka	A. J. Stout
Wellington	Claude Kissick
Wichita	L. W. Mayberry
Winfield	Evan E. Evans
Kentucky	
Ashland	W. L. Brooker
Bellevue	L. F. Gilligan
Bowling Green	T. C. Cherry
Catlettsburg	J. T. Miracle
Corbin	G. W. Campbell
Covington	G. O. Swing
Danville	L. C. Bosley
Dayton	Olin W. Davis
Fort Thomas	D. W. Bridges
Frankfort	J. W. Ireland
Glasgow	W. H. Sugg
Hazard	R. T. Whittinghill
Henderson	C. E. Dudley
Hopkinsville	Gladstone Koffman
Jenkins	C. V. Snapp
Lexington	Henry H. Hill
Louisville	Frederick Archer
Ludlow	J. S. Brown
Madisonville	Harper Gatton
Mayfield	K. R. Patterson
Maysville	John Shaw
Middlesboro	J. W. Bradner
Newport	A. D. Owens
Owensboro	J. L. Foust
Paducah	H. L. Smith
Paris	Lee Kirkpatrick
Richmond	W. F. O'Donnell
Somerset	P. H. Hopkins
Winchester	E. F. Birckhead
Louisiana	
Alexandria	H. M. Wells (b)
Bastrop	E. D. Shaw (b)
Baton Rouge	C. B. Turner, Acting (b)
Bogalusa	J. N. Herrington
Crowley	A. T. Browne (b)
Gretna	J. C. Ellis (b)
Hammond	C. C. Pittman (b)
Houma	H. L. Bourgeois (b)
Lafayette	J. N. Faulk (b)
Lake Charles	Ward Anderson
Minden	E. S. Richardson (b)
Monroe	E. L. Neville
Morgan City	L. A. Law (b)
New Iberia	L. G. Porter (b)
New Orleans	Nicholas Bauer (b)
Opelousas	W. B. Prescott (b)
Plaquemine	L. P. Terrebonne (b)
Shreveport	E. W. Jones (b)
West Monroe	T. O. Brown (b)
Maine	
Auburn	G. R. Gardner
Augusta	F. W. Burrill
Bangor	I. W. Small
Bath	C. D. Wilson
Belfast	.....
Biddeford	A. A. Garcelon
Brewer	H. R. Houston
Brunswick	Leon P. Spinney
Calais	Alden Allen
Caribou	G. M. Carter
Ft. Fairfield	W. H. Jenkins
Gardiner	A. R. Carter
Houlton	George Cumming
Lewiston	C. W. Bickford
Millinocket	W. M. Marr
Oldtown	W. O. Chase
Portland	W. B. Jack
Presque Isle	R. J. Carpenter
Rockland	E. L. Toner
Rumford	L. E. Williams
Saco	H. C. Hull
Sanford	J. A. Hamlin
Skowhegan	W. B. Woodbury
South Portland	L. C. Day
Waterville	C. E. Glover
Westbrook	Guy Sinclair
Maryland	
Annapolis	George Fox (a)
Baltimore	D. E. Weglein
Cambridge	J. B. Noble (a)
Cumberland	C. L. Kopp (a)
Frederick	E. W. Pruitt (a)
Frostburg	C. L. Kopp (a)
Hagerstown	B. J. Grimes (a)
Salisbury	J. M. Bennett (a)
Tacoma Park	Edwin W. Broome (a)
Massachusetts	
Abington	C. A. Record
Adams	James G. Reardan
Agawam	B. J. Phelps
Amesbury	Fred C. English
Amherst	L. L. Dudley
Andover	H. C. Sanborn
Arlington	C. H. Dempsey
Athol	G. S. Goodell
Attleboro	L. A. Fales
Auburn	C. M. Harris
Barnstable	R. R. Barr
Belmont	F. A. Scott
Beverly	Starr M. King
Billerica	E. C. Vining
Boston	P. T. Campbell
Braintree	C. E. Fisher
Bridgewater	John C. Davis
Brockton	J. F. Scully
Brookline	E. R. Caverly
Cambridge	M. E. Fitzgerald
Canton	A. S. Ames
Chelmsford	G. S. Wright
Chelsea	G. C. Francis
Chicopee	J. J. Desmond, Jr.
Clinton	T. F. Gibbons
Concord	W. A. Hall
Danvers	I. G. Smith
Dartmouth	A. R. Paull

City	Superintendent
Dedham	J. C. Anthony
Dracut	C. L. Randall
Easthampton	H. D. Casey
Easton	G. C. Mann
Everett	F. A. Ashley
Fairhaven	C. F. Prior
Fall River	H. L. Belisle
Fitchburg	J. M. McNamara
Foxborough	Chase McArthur
Framingham	B. J. Merriam
Franklin	A. W. Hale
Gardner	F. T. Reynolds
Gloucester	E. W. Fellows
Grafton	A. S. Cole
Great Barrington	R. H. Bellows
Greenfield	F. W. Porter
Haverhill	A. I. Clow
Hingham	O. K. Collins
Holyoke	W. R. Peck
Hudson	E. J. Harriman
Ipswich	J. I. Horton
Lawrence	B. M. Sheridan
Leominster	W. H. Perry
Lexington	T. S. Grindle
Lowell	V. M. McCartin
Ludlow	P. R. Baird
Lynn	H. S. Gruver
Malden	F. G. Marshall
Mansfield	Bert L. Merrill
Marblehead	James W. Vose
Marlboro	E. P. Carr
Maynard	J. P. King
Medford	J. S. Kadesch
Melrose	H. H. Stuart
Methuen	L. H. Conant
Middleboro	J. S. Cushing
Milford	A. O. Caswell
Millbury	C. C. Ferguson
Milton	H. F. Turner
Montague	J. S. Keating
Natick	C. R. Hall
Needham	Harry A. Brown
New Bedford	A. P. Keith
Newburyport	C. R. Thibadeau
Newton	Julius Warren
North Adams	G. C. Bowman
Northampton	F. K. Congdon
North Andover	F. E. Pitkin
North Attleboro	G. W. Morris
Northbridge	H. J. Phipps
Norwood	L. W. Grant
Orange	E. C. Hempel
Palmer	C. H. Hobson
Peabody	Wm. A. Welch
Pittsfield	Edward J. Russell
Plymouth	A. B. Handy
Quincy	J. N. Muir
Randolph	A. O. Christiansen
Reading	Arthur E. Pierce
Revere	C. F. Lindstol
Rockland	R. S. Esten
Salem	G. M. Bemis
Saugus	Vernon W. Evans
Shrewsbury	M. A. Sturtevant
Somerset	H. F. Bates
Somerville	E. W. Ireland
Southbridge	Fuller L. Austin
South Hadley	R. D. Tucker
Spencer	I. H. Agard
Springfield	John E. Granrud
Stoneham	C. E. Varney
Stoughton	Warren B. Lyman
Swampscott	Frank L. Mansur
Taunton	W. A. Mowry
Tewksbury	S. G. Bean
Uxbridge	A. B. Garcelon
Wakefield	W. B. Atwell
Walpole	A. C. Jones
Waltham	W. H. Slayton
Ware	W. R. Barry
Wareham	Bion C. Merry
Watertown	W. H. Price
Webster	J. A. Lobban
Wellesley	S. M. Graves
Westboro	J. H. Armstrong
Westfield	C. D. Stiles
West Springfield	J. R. Fausey
Weymouth	P. T. Pearson
Whitman	F. E. Holt
Winchendon	C. A. Mitchell
Winchester	J. J. Quinn
Winthrop	E. R. Clarke
Woburn	G. I. Clapp
Worcester	W. S. Young

Michigan

Adrian	Ernest J. Reed
Albion	Don Harrington
Alma	F. R. Phillips
Alpena	George H. Curtis
Ann Arbor	O. W. Haisley
Battle Creek	Eldon C. Geyer
Bay City	G. L. Jenner
Benton Harbor	S. C. Mitchell
Berkeley	R. B. French
Birmingham	C. W. Crandell
Cadillac	B. C. Shankland
Charlotte	Jay Dykhouse
Coldwater	J. T. Symons
Dearborn	Ray H. Adams
Detroit	Frank Cody
Dowagiac	C. M. Horn
East Detroit	John Kantner
Ecorse	C. J. Miller
Escanaba	John A. Lemmer
Ferndale	E. F. Down
Flint	L. H. Lamb
Gladstone	A. R. Watson
Grand Haven	E. H. Babcock
Grand Rapids	L. A. Butler
Grosse Pointe	S. M. Brownell
Grosse Pointe Park	.....
Hamtramck	M. A. Kopka
Hancock	H. S. Denison
Hastings	D. A. Van Buskirk
Highland Park	I. M. Allen
Hillsdale	B. L. Davis
Holland	E. E. Fell
Ionia	A. A. Rather
Iron Mountain	John Jelsch
Ironwood	Arthur E. Erickson
Ishpeming	C. L. Phelps
Jackson	Harold Steele
Kalamazoo	Herold C. Hunt
Kingsford	Frank C. Sweeney
Lansing	J. W. Sexton
Lapeer	E. E. Irwin
Lincoln Park	Leo W. Huff
Ludington	H. H. Hawley
Manistee	Benj. Klager
Manistique	A. F. Hall
Marquette	W. M. Whitman
Marshall	H. W. Holmes
Menominee	J. L. Silvernale
Midland	J. J. Schafer
Monroe	George T. Cantrick
Mount Clemens	L. W. Fast
Mount Pleasant	G. E. Ganiard
Muskegon	John A. Craig
Muskegon Heights	W. R. Booker
Negaunee	H. S. Doolittle
Niles	F. W. Crawford
Owosso	E. J. Willman
Petoskey	H. C. Spitler
Pontiac	James H. Harris
Port Huron	L. A. Packard
River Rouge	A. McDonald
Roseville	E. E. Crampton
Royal Oak	N. J. Quickstad
Saginaw	C. F. Miller
St. Joseph	E. B. Holden
Sault Ste. Marie	G. G. Malcolm
Sturgis	Waldo Adams
Three Rivers	C. H. Carrick
Traverse City	Lars Hockstad
Wyandotte	F. W. Frostic
Ypsilanti	E. H. Chapelle

Minnesota

Albert Lea	H. R. Peterson
Austin	S. T. Neveln
Bemidji	J. W. Smith
Brainerd	W. C. Cobb
Chisholm	J. P. Vaughan
Cloquet	E. B. Anderson
Columbia Heights	H. C. Nelson
Crookston	Arnold Gloor
Duluth	Leonard Young
Ely	W. E. Englund
Eveleth	A. D. S. Gillett
Fairmont	John J. Skinner
Faribault	C. Willard Cross
Fergus Falls	R. L. Brown
Hastings	E. A. Durbahn
Hibbing	J. W. Richardson
International Falls	J. A. Sathrum
Little Falls	E. C. Van Dusen
Mankato	J. E. Anderson
Minneapolis	C. R. Reed
Moorhead	S. G. Reinertsen
New Ulm	Ernest M. Hanson
Owatonna	Irvin E. Rosa
Red Wing	G. V. Kinney
Rochester	G. H. Sanberg
St. Cloud	H. B. Gough
St. Paul	S. O. Hartwell
South St. Paul	Irvin T. Simley
Stillwater	Guy D. Smith
Virginia	R. H. Brown
Willmar	A. M. Wisness
Winona	D. F. Dickerson

Mississippi

Biloxi	G. W. Ditto
Brookhaven	Edgar S. Bowlus
Clarksdale	H. B. Heidelberg
Columbus	C. N. Brandon
Corinth	Hal Anderson
Greenville	F. W. Murphy
Greenwood	W. C. Williams
Gulfport	B. Frank Brown
Hattiesburg	W. I. Thames
Jackson	J. G. Chastain
Laurel	R. H. Watkins
McComb	Joseph E. Gibson
Meridian	H. M. Ivy
Natchez	W. H. Braden
Tupelo	T. M. Milam
Vicksburg	H. V. Cooper
Yazoo City	R. J. Koonce

Missouri

Boonville	L. E. Ziegler
Brookfield	L. V. Crookshank
Cape Girardeau	L. G. Schultz
Carthage	J. L. Campbell
Chillicothe	H. R. McCall
Clayton	John L. Bracken
Clinton	Arthur Lee
Columbia	W. E. Rosenstengel
De Soto	O. T. Coil
Fulton	J. T. Bush
Hannibal	E. T. Miller
Independence	E. B. Street
Jefferson City	William F. Knox
Joplin	E. A. Elliott
Kansas City	George Melcher
Kirksville	J. H. Neville
Kirkwood	F. P. Tillman
Maplewood	G. E. Dille
Marshall	W. M. Westbrook
Maryville	J. L. Lawing
Mexico	L. H. Hawthorne
Moberly	M. F. Beach
Nevada	Wade Fowler
Poplar Bluff	G. F. Loughead
Richmond	P. L. Collier
St. Charles	Stephen Blackhurst
St. Joseph	I. E. Stutsman
St. Louis	Henry J. Gerling
Sedalia	Heber U. Hunt
Sikeston	Roy V. Ellise
Springfield	Harry P. Study
Trenton	W. H. McDonald
University City	Charles Banks
Warrensburg	Edward Beatty
Washington	C. J. Burger
Webb City	D. R. McDonald
Webster Groves	W. E. Goslin

Montana

Anaconda	W. K. Dwyer
Billings	A. T. Peterson
Bozeman	D. S. Williams
Butte	Douglas Gold
Great Falls	Irving W. Smith
Havre	W. J. Shirley

City	Superintendent
Helena	R. O. Evans
Kalispell	W. D. Swetland
Lewistown	C. G. Manning
Livingston	B. A. Winans
Miles City	Glen G. Eye
Missoula	Ira B. Fee
Nebraska	
Alliance	H. G. Partridge
Beatrice	E. L. Novotny
Columbus	R. R. McGee
Fairbury	W. E. Scott
Falls City	A. B. Gelwick
Fremont	A. H. Waterhouse
Grand Island	C. Ray Gates
Hastings	A. H. Staley
Kearney	Harry A. Burke
Lincoln	M. C. Lefler
McCook	J. E. Shedd
Nebraska City	Marion R. Schrader
Norfolk	A. P. Burkhart
North Platte	W. J. Braham
Omaha	Homer W. Anderson
Scottsbluff	A. L. Burnham
York	Earle W. Wiltse
Nevada	
Las Vegas	Maude Frazier
Reno	B. D. Billinghurst
New Hampshire	
Berlin	Lloyd P. Young
Claremont	A. B. Kellogg
Concord	Chester A. Moody
Derry	George H. Whitcher
Dover	Chester L. Howe
Franklin	Fred S. Libbey
Keene	Laurence O. Thompson
Laconia	John S. Gilman
Lebanon	W. J. English
Manchester	L. P. Benezet
Nashua	Earle T. Tracey
Portsmouth	Harry L. Moore
Rochester	Arthur S. Rollins
Somersworth	H. L. Winslow
New Jersey	
Asbury Park	A. E. Kraybill
Atlantic City	Arthur Chenoweth
Audubon	William L. Fidler
Bayonne	Preston H. Smith
Belleville	W. R. Parmer
Bergenfield	Roy W. Brown
Bloomfield	Edgar S. Stover
Bogota	G. W. Leman
Boonton	M. Burr Mann
Bound Brook	Albert S. Davis
Bridgeton	Leigh M. Lott
Burlington	Vann H. Smith
Caldwell	D. C. Barnett
Camden	Leon N. Neulen
Carlstadt	Edward F. Krom
Carteret	Barbara V. Hermann
Cliffside Park	George F. Hall
Clifton	George J. Smith
Collingswood	John B. Ritter
Cranford	L. N. Morrisett
Dover	R. S. Bowlby
Dumont	L. J. Honiss
Dunellen	May Higgins
East Orange	C. J. Scott
East Rutherford	Alfred S. Faust
Elizabeth	Ira T. Chapman
Englewood	Winton J. White
Fairview	Z. G. Masten, Jr.
Fort Lee	J. B. Thompson
Freehold	Lloyd S. Cassel
Garfield	J. Earl Thompson
Glen Ridge	H. W. Dutch
Gloucester	Charles T. Hassard
Guttenburg	Mary Klein
Hackensack	John A. Wilcox
Haddonfield	Allen S. Martin
Haddon Heights	William C. Davis
Hammonton	H. H. Smith
Harrison	John P. Murray
Hasbrouck H'ghts	C. C. Hitchcock
Hawthorne	F. H. Thoms
Highland Park	Algar Maynard
Hillside	A. G. Woodfield
Hoboken	Daniel S. Kealey
Irvington	Herschel S. Libby
Jersey City	James A. Nugent
Kearny	Edmund L. Tink
Leonia	Nelson C. Smith
Linden	D. A. Howell
Lodi	Henry V. Matthews
Long Branch	Charles T. Stone
Lyndhurst	H. P. Shepherd
Madison	Harry A. Wann
Manville	Harold I. Merritt
Metuchen	Carl H. Galloway
Millville	Wylie G. Pate
Montclair	Frank G. Pickell
Morristown	J. Burton Wiley
Neptune Towns'p	O. J. Moulton
Newark	John H. Logan
New Brunswick	F. J. Sickles
Newton	C. H. Reagle
North Arlington	J. A. Lindsay
North Bergen	R. W. Madden
Nutley	John A. Spargo
Ocean City	George E. Brown
Orange	W. B. Patrick
Palisades Park	Robert B. Havington
Passaic	A. D. Arnold
Paterson	John R. Wilson
Paulsboro	Fred A. Talbot
Pensauken Twp.	George B. Fine
Perth Amboy	W. C. McGinniss
Phillipsburg	C. V. Sloan
Plainfield	F. W. Cook
Pleasantville	Simon M. Horstick
Princeton	B. Woodhull Davis
Prospect Park	Thomas L. Bump
Rahway	Arthur Perry
Red Bank	Edwin C. Gilland
Ridgefield	Charles Dixon
Ridgewood	I. B. Somerville
Roselle	John R. Patterson
Roselle Park	E. F. Smith
Rutherford	C. A. Fetterly
Salem	Halliday R. Jackson
Sayreville	Emma Arlette
Secaucus	M. J. Pechtel
Somerville	T. Latimer Brooks
South Amboy	Oscar O. Barr
South Orange	John H. Bosshart
South Plainfield	Harry C. Fries
South River	Wilbur A. Bryan
Summit	John B. Dougall
Teaneck	Lester N. Neulen
Tenafly	George A. Kipp
Trenton	Paul Loser
Union City	Arthur O. Smith
Union Twp.	Edward F. Waldron
Verona	F. N. Brown
Vineland	Lawrence R. Winchell
Wallington	Joseph F. Moriarty
Weehawken	Kenneth F. Woodbury
Westfield	C. A. Philhower
West New York	H. L. Bain
West Orange	S. C. Strong
Wildwood	Henry C. Chalmers
Woodridge	Victor C. Nicklas
New Mexico	
Albuquerque	John Milne
Carlsbad	W. G. Donley
Clovis	J. M. Bickley
Gallup	Agnes Bartlett
Las Cruces	C. S. Conlee
Las Vegas	W. B. McFarland
Raton	E. E. Harrison
Roswell	D. N. Pope
Santa Fe	Isabel L. Eckles
New York	
Albany	Austin R. Coulson
Amsterdam	Wilbur H. Lynch
Auburn	George F. Barford
Batavia	Clyde P. Wells
Beacon	E. D. Hewes
Binghamton	Daniel J. Kelly
Bronxville	Willard W. Beatty
Buffalo	E. C. Hartwell
Canandaigua	Frank E. Fisk
Catskill	J. M. Schnitzer
Cohoes	William S. Schneider
Corning	William E. Severn (Dist. No. 9)
	Hugh W. Gregg (Dist. No. 13)
Cortland	Leo T. Wilcox
Depew	George R. Crego
Dobbs Ferry	J. A. McGinness
Dunkirk	F. R. Darling
East Rochester	Theodore L. R. Morgan
Elmira	H. O. Hutchinson
Elmira Heights	John W. Sahlstrom
Endicott	Herbert H. Crumb
Floral Park	.....
Fredonia	Claude R. Dye
Freeport	John W. Dodd
Fulton	George R. Bodley
Garden City	Winfield A. Townsend
Geneva	W. L. Houseman
Glen Cove	H. H. Chapman
Glens Falls	A. W. Miller
Gloversville	H. W. Langworthy
Hastings-on-Hudson	John L. Hopkins
Haverstraw	J. T. Kaemmerlen
Hempstead	William A. Gore
Herkimer	Loraine W. Bills
Hornell	Harrison S. Dodge
Hudson	M. C. Smith
Hudson Falls	David R. Finley
Ilion	Earl P. Watkin
Ithaca	C. L. Kulp
Jamestown	George A. Persell
Johnson City	H. B. Eccleston
Johnstown	E. L. Ackley
Kenmore	F. C. Densberger
Kingston	B. C. Van Ingen
Lackawanna	Clarence A. Conway
Lancaster	Frank L. Smith
Little Falls	Carlyle C. Ring
Lockport	R. B. Kelley
Long Beach	Walter J. Schwalje
Lynbrook	C. D. Vosburgh
Malone	Horace H. Lamberton
Mamaroneck	Arthur Z. Boothby
Massena	E. G. Simmons
Mechanicville	John N. Hayes
Medina	A. E. Trippensee
Middletown	E. H. Burdick
Mineola	Harlan B. Allen
Mount Kisco	H. M. Jennings
Mount Vernon	William H. Holmes
Newark	F. Neff Stroup
Newburgh	Marion W. Longman
New Rochelle	C. S. Bragdon
New York	Harold G. Campbell
Niagara Falls	James F. Taylor
North Tarrytown	Delbert O. Fuller
North Tonawanda	Claude L. Moss
Norwich	F. R. Wassung
Nyack	K. R. MacCalman
Ogdensburg	Arthur J. Laidlaw
Olean	W. C. Greenawalt
Oneida	Albert H. Covell
Oneonta	George J. Dann
Ossining	Harold V. Loomis
Oswego	Frederick Leighton
Patchogue	Sheridan Linn
Peekskill	J. E. Scott
Penn Yan	C. G. Hetherington
Plattsburg	G. M. Elmendorf
Port Chester	Evan E. Jones
Port Jervis	A. H. Naylor
Poughkeepsie	Ward C. Moon
Rensselaer	Walter S. Clark
Rochester	James M. Spinning
Rockville Center	Floyd B. Watson
Rome	George R. Staley
Rye Neck	Donald M. Tower
Salamanca	George A. Place
Saranac Lake	H. V. Littell
Saratoga Springs	Harris Crandall
Scarsdale	Vernon G. Smith
Schenectady	W. H. Pillsbury
Scotia	B. W. Conrad
Seneca Falls	Hubert Mott
Solvay	Claude A. Duvall
Syracuse	G. Carl Alverson
Tarrytown	J. Leroy Thompson
Tonawanda	Ralph Mosher
Troy	Neil K. White (Lansingburg Dist.)
	George H. Krug (Union District)
Tupper Lake	R. E. Minnich
Utica	John A. De Camp

City	Superintendent
Watertown	C. E. Sabin
Watervliet	William Richmond
Waverly	P. C. Meserve
Wellsville	George F. Jammer
Whitehall	Page E. Cole
White Plains	H. Claude Hardy
Yonkers	Lamont F. Hodge
North Carolina	
Asheboro	Reginald Turner
Asheville	R. H. Latham
Burlington	H. M. Roland
Canton	A. J. Hutchins
Charlotte	H. P. Harding
Concord	A. S. Webb
Durham	W. F. Warren
Elizabeth City	E. E. Bundy
Fayetteville	Horace Sisk
Gastonia	W. P. Grier
Goldsboro	Ray Armstrong
Greensboro	Guy B. Phillips
Greenville	J. H. Rose
Henderson	E. M. Rollins
Hendersonville	F. M. Waters
Hickory	R. W. Carver
High Point	T. Wingate Andrews
Kings Mountain	B. N. Barnes
Kinston	W. A. Graham
Lenoir	C. S. Warren
Lexington	A. W. Honeycutt
Monroe	W. R. Kirkman
Mooresville	H. C. Miller
Morganton	W. F. Starnes
Mount Airy	L. B. Pendergraph
New Bern	H. B. Smith
Raleigh	P. S. Daniel
Reidsville	L. J. Perry
Rocky Mount	R. M. Wilson
Salisbury	J. H. Knox
Shelby	B. L. Smith
Statesville	R. M. Gray
Tarboro	W. A. Mahler
Thomasville	J. N. Hauss
Washington	E. S. Johnson
Wilmington	Ray Funderburk
Wilson	K. R. Curtis
Winston-Salem	J. W. Moore
North Dakota	
Bismarck	H. O. Saxvik
Devils Lake	F. H. Gilliland
Dickinson	P. S. Berg
Fargo	H. H. Kirk
Grand Forks	Elroy Schroeder
Jamestown	C. L. Robertson
Mandan	J. C. Gould
Minot	L. A. White
Valley City	G. W. Hanna
Williston	J. N. Urness
Ohio	
Akron	Ralph H. Waterhouse
Alliance	B. F. Stanton
Ashland	J. E. Bohn
Ashtabula	M. S. Mitchell
Athens	Harper C. Pendry
Barberton	U. L. Light
Bedford	A. E. Moody
Bellaire	J. V. Nelson
Bellefontaine	S. A. Frampton
Bellevue	D. H. Patton
Berea	J. F. Koeppe
Bexley	H. C. Dieterich
Bowling Green	Arch B. Conklin
Bucyrus	D. C. Baer
Cambridge	Hugh R. Hick
Campbell	Andrew S. Klinko
Canton	Jesse H. Mason
Chillicothe	M. M. Berry
Cincinnati	Edward D. Roberts
Circleville	Frank Fischer
Cleveland	Charles H. Lake
Cleveland H'ghts	Frank L. Wiley
Columbus	J. G. Collicott
Conneaut	C. M. Dickey
Coshocton	A. C. Pence
Cuyahoga Falls	Gilbert Roberts
Dayton	C. V. Courter
Defiance	B. M. Lindemuth
Delaware	D. R. Smith
Delphos	E. W. Bell
Dover	C. E. Palmer
East Cleveland	W. H. Kirk
East Liverpool	Herbert G. Means
East Palestine	T. R. Hersh
Elyria	R. C. Maston
Euclid	E. C. Grover
Findlay	I. F. Matteson
Fostoria	J. M. Reed
Fremont	H. H. Church
Galion	J. F. Bemiller
Gallipolis	Wayne Lutz
Garfield Heights	Harold R. Maurer
Girard	E. O. Trescott
Grandview H'ghts (Columbus P. O.)	W. C. Rohleder
Greenville	C. L. Bailey
Hamilton	D. R. Baker
Ironton	John A. Miller
Jackson	H. L. Bates
Kent	W. A. Walls
Kenton	L. E. McKinley
Lakewood	Geo. A. Bowman
Lancaster	C. L. Berry
Lima	R. E. Offenhauer
Lockland	J. U. Dungan
Logan	G. E. Carr
Lorain	P. C. Bunn
Mansfield	W. L. Miller
Maple Heights (Bedford P. O.)	M. C. Helm
Marietta	H. L. Sullivan
Marion	C. A. Hudson
Martins Ferry	W. L. Kocher
Massillon	L. J. Smith
Miamisburg	Harris V. Bear
Middletown	R. W. Solomon
Mingo Junction	Claude A. Bruner
Mount Vernon	A. W. Elliott
Nelsonville	E. J. Arnold
Newark	O. E. Pore
New Boston	D. E. Ross
New Philadelphia	H. S. Carroll
Niles	S. J. Bonham
Norwalk	H. C. Ellis
Norwood	C. W. Johnson
Oakwood (Dayton P. O.)	A. E. Claggett
Painesville	C. C. Pierce
Parma	F. S. Shields
Piqua	G. C. Dietrich
Portsmouth	Frank Appel
Ravenna	C. R. Dustin
Reading	H. L. Bussey
Rocky River	J. J. Young
St. Bernard	C. W. Williams
St. Marys	C. C. McBroom
Salem	E. S. Kerr
Sandusky	F. J. Prout
Shaker Heights	F. H. Bair
Shelby	R. I. Lewis
Sidney	C. C. Crawford
Springfield	F. M. Shelton
Steubenville	Russell H. Erwine
Struthers	H. E. Zuber
Tiffin	Paul V. Brown
Toledo	Ralph E. Dugdale
Toronto	S. C. Dennis
Troy	T. E. Hook
Uhrichsville	H. B. Galbraith
Urbana	C. W. Cookson
Van Wert	U. E. Diener
Wadsworth	Frank H. Close
Wapakoneta	M. R. Menschel
Warren	H. B. Turner
Washington Court House	A. D. St. Clair
Wellston	H. L. Holter
Wellsville	S. E. Daw
Wilmington	H. W. Hodson
Wooster	C. M. Layton
Xenia	L. C. Hammerle
Youngstown	Geo. E. Roudebush
Zanesville	C. T. Prose
Oklahoma	
Ada	B. R. Stubbs
Altus	A. G. Steele
Alva	C. A. Parker
Anadarko	H. L. Hensley
Ardmore	O. E. Shaw
Bartlesville	H. E. Wrinkle
Blackwell	Harry Hutson
Bristow	E. H. Black
Chickasha	T. T. Montgomery
Clinton	George D. Hann
Cushing	W. B. French
Duncan	N. L. George
Durant	G. T. Stubbs
Elk City	A. M. Keeth
El Reno	Paul R. Taylor
Enid	DeWitt Waller
Guthrie	W. A. Greene
Henryetta	E. E. Battles
Holdenville	Ben J. Foster
Hugo	Harvey M. Black
Lawton	B. C. Swinney
McAlester	M. J. Hale
Miami	R. C. Nichols
Muskogee	J. R. Holmes
Norman	J. B. Stout
Oklahoma City	C. K. Reiff
Okmulgee	W. Max Chambers
Pawhuska	Homer C. Heard
Picher	L. R. Pfost
Ponca City	C. P. Howell
Sand Springs	Clyde H. Odell
Sapulpa	E. O. Shaw
Seminole	John G. Mitchell
Shawnee	A. L. Burks
Stillwater	E. D. Price
Tulsa	H. W. Gowans
Wewoka	Harry D. Simmons
Woodward	E. H. Homberger
Oregon	
Albany	Rex Putnam
Astoria	A. C. Hampton
Baker	Hugh Coleman
Bend	R. E. McCormack
Corvallis	H. W. Adams
Eugene	H. R. Goold
Klamath Falls	J. P. Wells
La Grande	A. L. Gralapp
Marshfield	Lynn A. Parr
Medford	E. H. Hedrick
Oregon City	J. T. Longfellow
Pendleton	Austin Landreth
Portland	Charles A. Rice
Salem	Silas Gaiser
The Dalles	J. F. Cramer
Pennsylvania	
Abington	Joseph C. Wierick
Aliquippa	H. R. Vanderslice
Allentown	H. W. Dodd
Altoona	Robert E. Laramy
Ambridge	J. R. Miller
Archbald	John F. Moran
Arnold	Donald P. Davis
Ashland	Edward W. Taylor
Ashley	Robert C. Metz
Avalon	S. Todd Perley
Bangor	O. W. Ackerman
Beaver	D. H. Stewart
Beaver Falls	J. Roy Jackson
Bellevue	Harry E. Brumbaugh
Bensalem twp. (Address Hulmeville)	Samuel K. Faust
Berwick	M. E. Houck
Bethlehem	W. H. Weiss
Blairsville	Nevin Montgomery, Acting
Blakely Boro. (Address Peckville)	H. B. Anthony
Bloomsburg	L. P. Gilmore
Brackenridge	Robert R. Anderson
Braddock	T. G. McCleary
Bradford	James F. Butterworth
Brentwood	J. D. Boydston
Bridgeport	C. C. Smith
Bristol	Warren P. Snyder
Brownsville	Robert Austin
Butler	John A. Gibson
Canonsburg	F. W. McVay
Carbondale	Mary B. McAndrew
Carlisle	J. W. Potter
Carnegie	Norman L. Glasser
Cecil twp. (Address Canonsburg)	H. S. Kuder
Centerville	C. H. Lyons

City	Superintendent
Chambersburg	U. L. Gordy
Charleroi	T. L. Pollock
Cheltenham twp. (Address Elkins Park)	Frank C. Ketler
Chester	F. Herman Fritz
Clairton	H. D. Teal
Clearfield	S. F. W. Morrison
Clifton Heights	Charles A. Brinton
Coaldale	J. E. Gildea
Coatesville	Carl O. Benner
Collingdale	T. E. Stengle
Columbia	J. B. Kennedy
Connellsville	Bela B. Smith
Conshohocken	Robert C. Landis
Coraopolis	J. C. Werner
Corry	Ralph S. Dewey
Crafton	E. O. Liggitt
Danville	E. B. Cline
Darby	W. R. Douthett
Derry twp. (Address Hershey)	J. I. Baugher
Dickson City	P. M. Brennan
Donora	John E. Shambach
Dormont	Ralph Radcliffe
Du Bois	R. W. Robinson
Dunbar twp. (Address Leisenring)	R. K. Smith
Dunmore	J. R. Gilligan
Dupont	Cecile T. Dugan
Duquesne	C. H. Wolford
Duryea	John J. Joyce
Easton	James C. Bay
East Pittsburgh	Charles F. Young
East Stroudsburg	Elmer E. Kuntz
Edwardsville	Victor E. Lewis
Ellwood City	Vaugh R. DeLong
Emaus	H. J. Yeager
Erie	C. Herman Grose
Etna	H. G. Norris
Exeter	John B. Campbell
Farrell	W. W. Irwin
Fell twp. (Address Carbondale)	John H. Campbell
Ford City	Quincey G. Vincent
Forest City	Jules J. Kerl
Forty Fort	Rexford J. Noack
Frackville	W. R. Trautman
Franklin	Karl M. Russell
Freeland	N. P. Luckenbill
Gettysburg	L. C. Keefauver
Glassport	John S. Hart
Greensburg	Wm. H. McIlhattan
Greenville	R. D. Welch
Grove City	H. M. B. Lehn
Hanover	C. V. Erdly
Hanover twp.	Edward S. Williams
Harrisburg	E. R. Abernethy
Harrison twp. (Address Natrona)	M. G. Morris
Haverford twp. (Address Upper Darby)	J. Frank Carter
Hazle twp. (Address Hazleton)	M. W. Garrette
Hazleton	A. D. Thomas
Holidaysburg	Hobson C. Wagner
Homestead	Port Eckles
Honesdale	J. J. Koehler
Huntington	J. G. Everard
Indiana	Norman C. Koontz
Jeanette	E. W. Long
Jersey Shore	Charles W. Potter
Johnstown	Dale D. McMaster
Kane	Glennis H. Rickert
Kingston	J. R. Merkel
Kittanning	Clyde W. Cranmer
Kulpmont	J. A. Shovlin
Lancaster	H. E. Gress
Lansdale	Ralph R. Smith
Lansdowne	S. N. Ewan, Jr.
Lansford	E. M. Balsbaugh
Larksville	Thomas F. Feeney
Latrobe	John G. Hulton
Lebanon	John W. Hedge
Lehighton	Bert B. David
Lewistown	D. M. Albright
Lock Haven	J. F. Puderbaugh
Lower Merion twp. (Address Ardmore)	S. Edgar Downs
Luzerne	T. S. Williams
Luzerne twp. (Address South Brownsville)	James J. Pauley
Mahanoy City	Joseph F. Noonan
Mahanoy twp. (Address Mahanoy City	Joseph F. Noonan
Mauch Chunk twp. (Address Nesquehoning)	Clayton W. Wotring
McAdoo	Sallie L. Ferry
McKeesport	James H. Lawson
McKees Rocks	T. K. Johnston
Meadville	Warren P. Norton
Mechanicsburg	R. L. Van Scoten
Media	W. H. Michaels
Middletown	G. W. Feaser
Midland	W. S. Bazard
Millvale	V. C. Holsinger
Milton	Carl L. Millward
Minersville	C. E. Roudabush
Monessen	Wade F. Blackburn
Monongahela	John H. Dorr
Morrisville	M. R. Reiter
Mount Carmel	G. A. Beierschmitt
Mount Lebanon	H. V. Herlinger
Mount Oliver	Minnie Ubinger
Mount Pleasant	J. C. Haberlen
Mount Pleasant twp. (Address Mt. Pleasant)	Lloyd F. Rumbaugh
Muhlenberg twp. (Address Temple)	C. E. Cole
Munhall	Charles R. Stone
Nanticoke	A. P. Diffendafer
Nanty-Glo	C. H. Bowers
Nazareth	F. A. Marcks
New Brighton	S. W. Lyons
New Castle	Clyde C. Green
New Kensington	E. T. Chapman
Newport twp. (Address Glen Lyon)	H. U. Nyhart
Norristown	H. O. Dietrich
Northampton	G. A. Eichler
North Braddock	F. D. Zuerner
Oakmont	W. Lee Gilmore
Oil City	R. A. Baum
Old Forge	B. T. Harris
Olyphant	John A. Dempsey
Palmerton	J. N. Roeder
Philadelphia	Edwin C. Broome
Phoenixville	Martin L. Peters
Pitcairn	R. L. Roose
Pittsburgh	Ben G. Graham
Pittston	D. J. Cray
Plains twp. (Address Plains)	Michael Hughes
Plymouth	H. S. Jones
Pottstown	Frank Haiston
Pottsville	L. A. BuDahn
Punxsutawney	F. S. Jackson
Radnor twp. (Address Wayne)	Sydney V. Rowland
Rankin	Frank J. Good
Reading	Thomas Henry Ford
Ridgway	A. C. Nelson
Rochester	Robert P. Barner
Rostraver twp. (Address Belle Vernon)	W. H. Cober
St. Clair	Charles R. Birch
St. Marys	J. J. Lynch
Sayre	Horace H. Beach
Schuylkill Haven	Paul S. Christman
Scottdale	S. B. Bulick
Scranton	John H. Dyer
Sewickley	L. H. Conway
Shamokin	P. E. Whitmeyer
Sharon	W. D. Gamble
Sharpsburg	J. J. Donovan
Sharpsville	Harry E. Pebly
Shenandoah	A. J. Ratchford
South Williamsport	A. B. Elder
Steelton	Orris H. Aurand
Stowe twp. (Address McKees Rocks)	Gale F. Stroup
Stroudsburg	Robert Brown
Summit Hill	E. T. McCready
Sunbury	C. C. Maderia
Swissvale	C. S. Baily
Swoyerville	Joseph H. Finn
Tamaqua	F. G. Horner
Tarentum	A. D. Endsley
Taylor	W. J. Powell
Throop	John J. O'Hara
Titusville	G. A. Stetson
Tredyffrin twp. (Address Berwyn)	Wilmer K. Groff
Turtle Creek	W. A. Rodgers
Tyrone	W. W. Eisenhart
Uniontown	J. N. Mowls
Upper Darby	William C. Sampson
Upper Merion twp. (Address King of Prussia)	Lloyd A. Moll
Vandergrift	John R. Kurtz
Warren	J. G. Rossman
Washington	Meyers B. Horner
Waynesboro	D. J. Keener
West Chester	Walter L. Philips
West Mahanoy twp. (Address Lost Creek)	Henry F. Murray
West Hazleton	E. S. Teter
West Pittston	R. J. W. Templin
West View	R. E. McKee
West York	A. H. Martin
Whitehall twp. (Address Egypt)	William D. Landis
Wilkes-Barre	A. E. Bacon
Wilkinsburg	W. C. Graham
Williamsport	A. M. Weaver
Wilmerding	Charles W. Shaffer
Wilson Boro. (Address Easton)	C. E. Furst
Windber	Joseph L. Hackenberg
Winton Boro. (Address Jessup)	J. L. McCloskey
Yeadon	Charles E. Hershey
York	A. W. Ferguson
Rhode Island	
Barrington	Charles H. Keyes
Bristol	E. S. Mapes
Burrillville	J. C. Sweeney
Central Falls	James E. Martin
Coventry	R. E. E. Campbell
Cranston	C. W. Bosworth
Cumberland	Bernard F. Norton
East Providence	J. R. D. Oldham
Johnston	Albert A. Thornton
Lincoln	John L. Smith
Newport	Harold T. Lowe
North Providence	James L. McGuire
Pawtucket	Frank A. R. Allen
Providence	A. J. Stoddard
South Kingstown	E. K. Wilcox
Warren	Leroy G. Staples
Warwick	Warren A. Sherman
Westerly	Willard H. Bacon
West Warwick	John F. Deering
Woonsocket	Leon M. Farrin
South Carolina	
Aiken	L. K. Hagood
Anderson	E. C. McCants
Camden	J. G. Richards, Jr.
Charleston	A. B. Rhett
Chester	Myron E. Brockman
Clinton	W. E. Monts
Columbia	A. C. Flora
Darlington	J. C. Daniel
Florence	John W. Moore
Gaffney	W. E. Sawyer
Georgetown	W. C. Bynum
Greenville	J. L. Mann
Greenwood	W. E. Black

City	Superintendent
Hartsville	J. H. Thornwell
Laurens	C. K. Wright
Newberry	O. B. Cannon
Orangeburg	A. J. Thackson
Rock Hill	R. C. Burts
Spartanburg	L. W. Jenkins
Sumter	
Union	T. C. Jolly, Jr.
South Dakota	
Aberdeen	C. L. Dalthorp
Huron	Andrew J. Lang
Lead	R. V. Hunkins
Mitchell	John C. Lindsey
Rapid City	E. B. Bergquist
Sioux Falls	A. A. MacDonald
Watertown	H. Mackenzie
Yankton	C. A. Beaver
Tennessee	
Alcoa	V. F. Goddard
Athens	J. C. Ridenour
Bristol	Ralph B. Rubins
Chattanooga	W. T. Robinson
Clarksville	C. H. Moore
Cleveland	R. T. Allen
Columbia	R. L. Harris
Dyersburg	C. M. Walker
Elizabethton	E. L. Bowers
Greenville	Mac Alexander
Jackson	C. B. Ijams
Johnson City	Roy G. Biglow
Kingsport	R. N. Robinson
Knoxville	Harry Clark
Memphis	R. L. Jones
Morristown	Carl T. Vance
Murfreesboro	J. C. Mitchell
Nashville	H. F. Srygley
Paris	W. O. Inman
Shelbyville	Troy G. Young
Springfield	Wilbur S. Young
Union City	J. T. Webb
Texas	
Abilene	R. D. Green
Amarillo	C. M. Rogers
Austin	A. N. McCallum
Beaumont	M. E. Moore
Big Spring	W. C. Blankenship
Bonham	H. A. Glass
Borger	W. A. McIntosh
Breckenridge	N. S. Holland
Brenham	M. B. Holleman
Brownsville	E. C. Dodd
Brownwood	E. J. Woodward
Bryan	S. M. Brown
Childress	A. W. Adams
Cisco	R. N. Cluck
Cleburne	Emmett Brown
Coleman	C. H. Hufford
Corpus Christi	E. H. Hereford
Corsicana	W. H. Norwood
Dallas	N. R. Crozier
Del Rio	R. M. Bankhead
Denison	F. B. Hughes
Denton	W. T. Daggett
Eagle Pass	F. R. Thompson
Electra	B. M. Dinsmore
El Paso	A. H. Hughey
Ennis	Newton W. McCann
Fort Worth	W. M. Green
Gainesville	H. O. McCain
Galveston	S. F. Graham
Goose Creek	W. R. Smith
Greenville	J. L. Bergin
Harlingen	E. C. Deering
Highland Park	H. E. Gable
Hillsboro	Loy W. Hartsfield
Houston	E. E. Oberholtzer
Huntsville	C. N. Shaver
Jacksonville	Larue Cox
Kingsville	C. E. Wade
Laredo	W. P. Galligan
Longview	Henry L. Foster
Lubbock	K. E. Oberholtzer
Lufkin	I. A. Coston
Luling	R. A. Box
Marlin	H. J. McIlhany
Marshall	J. P. Buck
McAllen	John H. Gregory
McKinney	Jack R. Ryan
Mercedes	Ernest H. Poteet
Mexia	R. M. Hawkins
Midland	W. W. Lackey
Mineral Wells	H. H. Hutto
Mission	H. C. Proctor
Nacogdoches	Rufus E. Price
Navasota	J. T. Ferguson
New Braunfels	E. A. Sahm
Orange	E. B. Stover
Palestine	Bonner Frizzell
Pampa	R. B. Fisher
Paris	A. H. Chamness
Plainview	C. E. Davis
Port Arthur	G. M. Sims
Ranger	W. T. Walton
San Angelo	Felix E. Smith
San Antonio	J. C. Cochran
San Benito	O. L. Davis
San Marcos	L. J. Berry
Seguin	Joe F. Saegert
Sherman	L. T. Cook
Sulphur Springs	W. L. Willis
Sweetwater	R. S. Covey
Taylor	E. T. Robbins
Temple	L. C. Procter
Terrell	J. E. Langwith
Texarkana	H. W. Stilwell
Tyler	J. M. Hodges
Uvalde	Guy D. Dean
Vernon	W. T. Lofland
Victoria	P. S. Garner
Waco	R. H. Brister
Waxahachie	G. B. Winn
Wichita Falls	H. D. Fillers
Yoakum	G. P. Barron
Utah	
Brigham	Hervin Bunderson (a)
Logan	E. Allen Bateman
Murray	James Clove
Ogden	W. Karl Hopkins
Provo	H. A. Dixon
Salt Lake City	L. John Nuttall, Jr.
Tooele	P. M. Nielsen (a)
Vermont	
Barre	Wm. H. Carter
Bennington	H. D. Sylvester
Brattleboro	Florence M. Wellman
Burlington	Lyman C. Hunt
Montpelier	W. A. Kincaid
Newport	E. A. Hamilton
Rockingham	F. M. Malcolm
Rutland	W. W. Fairchild
St. Albans	Josiah S. McCann
St. Johnsbury	Frank R. Adams
Winooski	G. R. Stackpole
Virginia	
Alexandria	T. C. Williams
Bristol	Roy B. Bowers
Charlottesville	James G. Johnson
Clifton Forge	Herman Blankinship
Covington	S. T. Godbey (d)
Danville	G. L. H. Johnson
Fredericksburg	G. H. Brown
Hampton	Robert M. Newton
Harrisonburg	W. H. Keister
Hopewell	R. W. Copeland
Lynchburg	Omer Carmichael
Martinsville	E. E. Givens (d)
Newport News	J. H. Saunders
Norfolk	C. W. Mason
Petersburg	Henry G. Ellis
Portsmouth	Harry A. Hunt
Pulaski	E. L. Darst (d)
Radford	W. K. Barnett
Richmond	J. H. Binford
Roanoke	D. E. McQuilkin
South Norfolk	R. H. Pride
Staunton	L. F. Shelburne
Suffolk	John E. Martin
Winchester	G. R. Quarles
Waynesboro	A. C. Gilkeson
Washington	
Aberdeen	C. J. Powell
Anacortes	De Fore Cramblitt
Bellingham	C. Paine Shangle
Bremerton	Tillman Peterson
Centralia	Clyde G. Campbell
Everett	R. E. Cook
Hoquiam	H. C. Crumpacker
Kelso	C. H. Lillie
Longview	E. J. McNamara
Olympia	L. P. Brown
Port Angeles	F. W. Breakey
Puyallup	P. B. Hanawalt
Seattle	Worth McClure
Spokane	O. C. Pratt
Tacoma	Elmer L. Breckner
Vancouver	Paul Gaiser
Walla Walla	W. M. Kern
Wenatchee	John W. Goddard
Yakima	A. C. Davis
West Virginia	
Beckley	B. B. Chambers (a)
Bluefield	C. H. Archer (a)
Charleston	Fred L. Teal (a)
Clarksburg	J. A. Jackson (a)
Elkins	Bryan Hamilton (a)
Fairmont	J. J. Straight (a)
Grafton	E. G. Kuhn (a)
Hinton	Margaret Nicely (a)
Huntington	R. B. Marston (a)
Keyser	Paul C. Rouzer (a)
Martinsburg	G. Wm. Rapp (a)
Morgantown	Floyd B. Cox (a)
Moundsville	Louis R. Potts (a)
Parkersburg	John A. Davis, Jr. (a)
Princeton	C. H. Archer (a)
Richwood	L. O. Bobbitt (a)
South Charleston	Fred L. Teal (a)
Welch	George W. Bryson (a)
Wellsburg	Olen Rutan (a)
Weston	J. G. Auville (a)
Wheeling	J. P. McHenry (a)
Williamson	C. O. Batson (a)
Wisconsin	
Antigo	P. A. Tipler
Appleton	Ben J. Rohan
Ashland	I. O. Hubbard
Baraboo	A. C. Kingsford
Beaver Dam	A. H. Luedke
Beloit	D. F. R. Rice
Chippewa Falls	Robert F. Lohrie
Cudahy	J. R. Brandsmark
De Pere	T. J. McGlynn
Eau Claire	Alvin T. Stolen
Fond du Lac	L. P. Goodrich
Fort Atkinson	Frank C. Bray
Green Bay	G. E. Denman
Janesville	V. E. Klontz
Kaukauna	J. F. Cavanaugh
Kenosha	G. F. Loomis
La Crosse	G. M. Wiley
Madison	R. W. Bardwell
Manitowoc	Hugh S. Bonar
Marinette	
Marshfield	R. F. Lewis
Menasha	F. B. Younger
Menomonie	W. G. Ballentine
Merrill	George F. Brooks
Milwaukee	M. C. Potter
Monroe	E. O. Evans
Neenah	C. F. Hedges
Oconto	L. W. Fulton
Oshkosh	Charles C. Bishop
Portage	A. J. Henkel
Racine	Wm. C. Giese
Rhinelander	W. F. Kruschke
Rice Lake	W. F. Waterpool
Sheboygan	H. E. Smith
Shorewood	H. S. Hemenway
South Milwaukee	John P. Mann
Stevens Point	P. M. Vincent
Superior	W. R. Davies
Two Rivers	Fred G. Bishop
Watertown	R. A. Buell
Waukesha	G. O. Banting
Waupun	H. C. Wegner
Wausau	E. C. Hirsch
Wauwatosa	W. T. Darling
West Allis	H. B. Nash
Whitefish Bay	C. L. Mulrine
Wisconsin Rapids	A. R. Page
Wyoming	
Casper	R. S. Hicks
Cheyenne	A. S. Jessup
Laramie	A. A. Slade
Rock Springs	E. M. Thompson
Sheridan	J. J. Early

REFERENCES

(a) County superintendent. (b) Parish superintendent.

Section XIV

SUPERINTENDENTS OF CATHOLIC PAROCHIAL SCHOOLS

ARCHDIOCESES

BALTIMORE, MD.—Rev. John I. Barrett, Diocesan Superintendent of Schools, The Bureau of Catholic Education, 415 Cathedral Street.

BOSTON, MASS.—Rev. Richard J. Quinlan, Diocesan Supervisor of Schools, 75 Union Park Street.

CHICAGO, ILL.—Rev. D. F. Cunningham, Diocesan Superintendent of Schools, 5112 Washington Boulevard.

CINCINNATI, OHIO.—Rev. Carl J. Ryan, Superintendent of Parochial Schools, 28 Calhoun Street.

DUBUQUE, IOWA.—Rt. Rev. Msgr. John M. Wolfe, Diocesan Superintendent of Schools, Corner Eleventh and Bluff Streets.

MILWAUKEE, WIS.—Rev. Joseph F. Barbian, Diocesan Superintendent of Schools, 2000 West Wisconsin Avenue.

NEW ORLEANS, LA.—Rev. Edward C. J. Prendergast, Archdiocesan Superintendent of Catholic Schools, 7845 Apricot Street.

NEW YORK, N. Y.—Rev. William R. Kelly, Executive Secretary of School Board for the Archdiocese, 23 East Fifty-first Street.

PHILADELPHIA, PA.—Rt. Rev. Msgr. John J. Bonner, Superintendent of Parochial Schools, 19th and Wood Streets.

PORTLAND, ORE.—Rev. Warren A. Waitt, Diocesan Superintendent of Schools, 1217 East Salmon Street.

ST. LOUIS, MO.—Rev. James P. Murray, Superintendent of Parish Schools, 2336 University Street.

ST. PAUL, MINN.—Rev. James A. Byrnes, Diocesan Superintendent of Schools, 240 Summit Avenue.

SAN ANTONIO, TEXAS.—Rev. M. S. Garriga, President of the School Board, 2121 South Presa Street.

SAN FRANCISCO, CALIF.—Rev. James H. Long, Diocesan Superintendent of Schools, 50 Oak Street.

DIOCESES

ALBANY, N. Y.—Rev. James P. Hanrahan, Superintendent of Parish Schools, 51 State Street.

ALTOONA, PA.—Rev. Francis McNelis, Diocesan Superintendent of Schools, 511 Twentieth Street.

BAKER CITY, ORE.—Rev. John D. Lee, Diocesan Superintendent of Schools.

BELLEVILLE, ILL.—Rev. John J. Fallon, Diocesan Superintendent of Schools, 6300 West Main Street.

BOISE, IDAHO.—Rev. J. P. O'Toole, Diocesan Superintendent of Schools, 412 State Street.

BROOKLYN, N. Y.—Rt. Rev. Msgr. Joseph V. S. McClancy, Diocesan Superintendent of Schools, 75 Greene Avenue.

BUFFALO, N. Y.—Rev. John W. Peel, Superintendent of Parochial Schools, 793 Elk Street.

BURLINGTON, VT.—Very Rev. W. P. Crosby, President of the School Board, 7 Fullerton Avenue, Montpelier, Vt.

CHARLESTON, S. C.—Rev. Joseph L. O'Brien, Diocesan Superintendent of Schools, 114 Broad Street.

CLEVELAND, OHIO.—Rev. John R. Hagan, Diocesan Superintendent of Schools, 605 Guarantee Title Building.

COLUMBUS, OHIO.—Rt. Rev. Msgr. John J. Murphy, Diocesan Superintendent of Schools, 1651 East Main Street.

CONCORDIA, KANS.—Rev. A. J. Luckey, President of the School Board, Manhattan, Kans.

CORPUS CHRISTI, TEXAS.—Rt. Rev. Msgr. J. J. Lannon, Diocesan Superintendent of Schools, St. Patrick's Cathedral.

COVINGTON, KY.—Rev. Alfred Hanses, Diocesan Superintendent of Schools, Holy Family School, Ashland, Ky.

CROOKSTON, MINN.—Rev. Victor Miller, Diocesan Superintendent of Schools, St. Joseph's Church, Ada, Minn.

DALLAS, TEXAS.—Rev. Thomas S. Zachry, Diocesan Superintendent of Schools, 2215 Ross Avenue.

DAVENPORT, IOWA.—Rev. P. J. O'Reilly, Diocesan Superintendent of Schools, St. Patrick's Rectory, Iowa City, Iowa.

DENVER, COLO.—Rev. W. D. McCarthy, Diocesan Superintendent of Schools, 230 East Seventeenth Avenue.

DES MOINES, IOWA.—Rev. L. V. Lyons, Diocesan Superintendent of Schools, Des Moines Catholic College, Tenth and College Avenues.

DETROIT, MICH.—Rev. Carroll F. Deady, Diocesan Superintendent of Schools, Sacred Heart Seminary, 2701 Chicago Boulevard.

DULUTH, MINN.—Rev. John Sholar, Diocesan Superintendent of Schools, 317 North Second Avenue W.

ERIE, PA.—Rev. Joseph J. Wehrle, Superintendent of Catholic Schools, 225 West Ninth Street.

FALL RIVER, MASS.—Rev. Edward J. Gorman, Superintendent of Diocesan Schools, 162 Walnut Street.

FARGO, N. DAK.—Rt. Rev. Msgr. John Baker, Diocesan Superintendent of Schools, Valley City, N. Dak.

FORT WAYNE, IND.—Rev. Thomas E. Dillon, Diocesan Superintendent of Schools, 903 North Jefferson Street, Huntington, Ind.

GALVESTON, TEXAS.—Rt. Rev. Jacob Schnetzer, Diocesan Superintendent of Schools, 4015 Sherman Avenue, Houston, Tex.

GRAND ISLAND, NEBR.—Rev. Bernard Galvin, Diocesan Superintendent of Schools, St. Michael's Church, Spalding, Nebr.

GREAT FALLS, MONT.—Rev. J. A. Rooney, Diocesan Superintendent of Schools, 1306 North Main Street, Walkerville, Mont.

GREEN BAY, WIS.—Rev. E. J. Westenberger, Superintendent of Catholic Schools, 128 South Monroe Avenue.

HARRISBURG, PA.—Rev. Harold E. Keller, Diocesan Superintendent of Parish Schools, Catholic High School, Twenty-third and Market Streets.

HARTFORD, CONN.—Rev. Austin Munich, Diocesan Supervisor of Schools, St. Thomas Seminary, Bloomfield, Conn.

HELENA, MONT.—Rev. J. A. Rooney, Diocesan Superintendent of Schools, 1306 North Main Street, Walkerville, Mont.

INDIANAPOLIS, IND.—Rev. Leonard Wernsing, Diocesan Superintendent of Schools, 128 West Georgia Street.

KANSAS CITY, MO.—Rev. V. A. Schroeger, Superintendent of Schools, 416 West Twelfth Street.

LA CROSSE, WIS.—Rev. Lester W. Seemann, Diocesan Superintendent of Schools, Twenty-fourth and Cass Streets.

LAFAYETTE, LA.—Very Rev. Anthony F. Canon Isenberg, Diocesan Superintendent of Schools, The Cathedral.

LEAVENWORTH, KANS.—Rt. Rev. Msgr. J. P. McInerney, President of the School Board, 204 West Eighth Street, Topeka, Kans.

LINCOLN, NEBR.—Rev. L. V. Barnes, Diocesan Superintendent of Schools, 1410 Sharp Building.

LITTLE ROCK, ARK.—Rt. Rev. Msgr. John J. Healy, Diocesan Superintendent of Schools, Little Rock College.

LOS ANGELES and SAN DIEGO, CALIF.—Rev. Martin McNicholas, Diocesan Superintendent of Schools, 606 Higgins Building, 108 West Second Street, Los Angeles, Calif.

LOUISVILLE, KY.—Rev. Felix N. Pitt, Diocesan Superintendent of Schools, 443 South Fifth Street.

MANCHESTER, N. H.—Rev. William P. Clancy, Diocesan Superintendent of Schools, Mount St. Mary's Academy, Hooksett, N. H.

MARQUETTE, MICH.—Rev. D. Joseph Breault, Diocesan Superintendent of Schools, St. George's Rectory, Bark River, Mich.

MOBILE, ALA.—Rev. L. J. Carroll, Superintendent of Parochial Schools, Bishop Toolen High School, 400 Government Street.

MONTEREY and FRESNO, CALIF.—Rev. Daniel J. Keenan, Diocesan Superintendent of Schools, 660 West Street, Hollister, Calif.

NASHVILLE, TENN.—Rev. George J. Flanigan, Diocesan Superintendent of Schools, 2300 Elliston Place.

NEWARK, N. J.—Very Rev. Msgr. William F. Lawlor, Diocesan Superintendent of Schools, 33 Mulberry Street.

OGDENSBURG, N. Y.—Rev. John M. Horan, Diocesan Superintendent of Schools, Wadhams Hall.

OKLAHOMA CITY and TULSA, OKLA.—Rev. F. A. Driscoll, President, Diocesan School Board, 1530 Rockford Avenue, Tulsa, Okla.

OMAHA, NEBR.—Rev. Joseph H. Ostdiek, Diocesan Superintendent of Schools, 2507 Cass Street.

PEORIA, ILL.—Rev. John A. O'Brien, Diocesan Superintendent of Schools, 604 East Armory Street, Champaign, Ill.

PITTSBURGH, PA.—Rev. Paul E. Campbell, Diocesan Superintendent of Schools, 5325 Penn Avenue.
PORTLAND, MAINE.—Rev. John J. Barrett, Diocesan Superintendent of Schools, Hebron, Maine.
PROVIDENCE, R. I.—Rev. Thomas V. Cassidy, Diocesan Superintendent of Parochial Schools, 20 Regent Avenue.
RAPID CITY, MICH.—Most Rev. John J. Lawler, President of the School Board, 1622 West Boulevard.
RICHMOND, VA.—Rev. Francis J. Byrne, Diocesan Superintendent of Schools, 811 Floyd Avenue.
ROCHESTER, N. Y.—Rev. John M. Duffy, Diocesan Superintendent of Schools, 50 Chestnut Street.
ROCKFORD, ILL.—Rev. William J. Donovan, Diocesan Superintendent of Schools, 95 East Wilson Street, Batavia, Ill.
SACRAMENTO, CALIF.—Rev. Stephen J. Keating, Diocesan Superintendent of Schools, 1017 Eleventh Street.
ST. CLOUD, MINN.—Rev. T. Leo Keaveny, Diocesan Superintendent of Schools, Cathedral Rectory, 316 Seventh Avenue, North.
SALT LAKE CITY, UTAH.—Rev. Joseph S. Keefe, Diocesan Superintendent of Schools, 650 South Eleventh East Street.
SCRANTON, PA.—Rev. J. J. Featherstone, Diocesan Superintendent of Schools, 315 Wyoming Avenue.
SIOUX CITY, IOWA.—Rev. C. Ivis, Diocesan Superintendent of Schools, Immaculate Conception Church, Cherokee, Iowa.
SIOUX FALLS, S. DAK.—Very Rev. Msgr. W. S. O'Meara, Diocesan Superintendent of Schools, Watertown, S. Dak.
SPRINGFIELD, ILL.—Rev. George M. Link, Diocesan Superintendent of Schools, 524 East Lawrence Avenue.
SPRINGFIELD, MASS.—Rt. Rev. Msgr. John F. Conlin, Diocesan School Visitor, Chicopee, Mass.
SUPERIOR, WIS.—Rev. Joseph Annabring, Diocesan Superintendent of Schools, 1201 Hughitt Avenue.
SYRACUSE, N. Y.—Rev. David C. Gildea, Diocesan Superintendent of Schools, 257 East Onondaga Street.
TOLEDO, OHIO.—Very Rev. Msgr. Francis J. Macelwane, Diocesan Superintendent of Catholic Schools, 58 Mettler Street.
TRENTON, N. J.—Rev. Michael A. Dalton, Diocesan Superintendent of Schools, St. Michael's Orphanage, Hopewell, N. J.
WHEELING, W. VA.—Rev. John J. O'Brien, Superintendent of Diocesan Schools, 126 East Pike Street, Clarksburg, W. Va.
WICHITA, KANS.—Rev. Leon A. McNeill, Diocesan Superintendent of Schools, 307 East Central Avenue.
WILMINGTON, DEL.—Rev. Leo W. O'Neill, Diocesan Superintendent of Schools, 1414 King Street.

Section XV

AIDS AVAILABLE TO LOCAL SCHOOL BOARDS FROM STATE DEPARTMENTS

Participation of State Agencies in Planning and Supervising Local School-Building Development

IN the planning of buildings for a public school system, it frequently is desirable to know the degree to which the state board of education has provided for participation and cooperation. The following summary segregates the character of the supervision given by the state and its representative agencies under three headings. The first item indicates the action which the state board may be expected to take. The second item shows the part played by the state superintendent of schools as the official spokesman for the state department of education. In the third part will be found indications of the assistance or guidance which other state agencies will give. The form of tabulation has necessitated very brief statements covering these responsibilities, but the degree and character of participation are clearly shown for each state. The list has been revised up to November, 1935.

THE STATES' PARTICIPATION IN SCHOOL-BUILDING CONSTRUCTION

ALABAMA

State Board of Education, Montgomery
Approves rules and regulations submitted by State Superintendent.

State Superintendent of Education, J. A. Keller
Prepares and submits to the State Board of Education rules and regulations pertaining to: minimum standards for school sites; minimum standards for plans, specifications, and construction of school buildings; for the issuance of warrants for capital outlay purposes.
Schoolhouse planning is a service in the Division of Administration and Finance. In addition to the preparation of rules and regulations as listed above, the following services are rendered:
Plans and specifications are prepared for rural school building construction.
Plans and specifications prepared by private architects are approved.
Buildings in process of construction are inspected upon request to determine whether plans and specifications are being followed.
Rules and regulations of the State Board are administered to insure the proper execution.
School surveys are carried on to provide the data for school building programs.
Each county is required to submit annually a building and capital outlay program which must be approved before actual work on the program is undertaken.

Director of the Division of Administration and Finance, Edgar L. Morphet
Supervisor of Schoolhouse Planning, R. E. Ledbetter
Architect, Clyde C. Pearson

ARIZONA

State Board of Education, Phoenix
No jurisdiction whatever in regard to buildings erected by districts.

State Superintendent of Public Instruction, H. E. Hendrix
No jurisdiction.

Other Agencies
Board of health issues regulations.

ARKANSAS

State Board of Education, Little Rock
Has a division of school grounds and schoolhouse planning.
Director prepares plans for 1- to 7-teacher buildings, and for such buildings as teachers' homes, shops, home economics buildings, gymnasiums, etc.
Furnishes preliminary sketches of floor plans for larger buildings.
Checks architects' plans for school buildings upon request.
Advises school officials as to plans for remodeling, repairing and altering school buildings.
Advises superintendents and teachers as to interior arrangements, furniture and equipment.
Superintends the construction of all school buildings during progress of erection.

State Commissioner, W. E. Phipps
No legal provision for approval.

Director, School Plant Division, J. Odell Baker

CALIFORNIA

State Superintendent of Public Instruction, Vierling Kersey, Sacramento
Division of schoolhouse planning passes on all plans costing more than $5,000, excepting those in the largest cities; is called into consultation by city districts, and controls other situations by surveys.
Site sizes and locations controlled by state standards.
No building contract, in situations coming under the department's jurisdiction, is legal without the required approval.
This department does not make working drawings.

Chief of Division of Schoolhouse Planning, Dr. Charles W. Bursch

COLORADO

State Superintendent of Public Instruction, Mrs. Inez Johnson Lewis, Denver
School building handled by local boards of education.

CONNECTICUT

State Board of Education, Hartford
Has a section of Buildings and Plans which approves plans for enlargement and new construction. It inspects school buildings for safety.
Publishes standards for guidance of local boards.
Has architect to whom plans are referred.
Assists local communities in building surveys.

State Commissioner, E. W. Butterfield
Assistant Supervisor of Buildings and Plans, John E. Nichols

DELAWARE

State Board of Education, Dover
Outside Wilmington prepares a tentative program of school building to submit to local boards.
Hears comments and suggestions thereon.
Creates standards with effect of law, governing hygienic, sanitary, and protective construction; selection, arrangement, and maintenance of sites; condemns school buildings.
Has approval of plans and specifications.

State Superintendent of Public Instruction, Dr. H. V. Holloway

Other Agencies
Legislature has created a state school-building act.
There is a state school-building account.
State school-building commission for each district.
Plans approved by state board of education and commission.
Buildings built by commission.
Construction supervised by commission.
Board of health has to approve drinking water and sewage disposal.

FLORIDA

State Superintendent of Public Instruction, Dr. W. S. Cawthon, Tallahassee

Has oversight, charge, and management of all matters pertaining to public schools, school buildings and grounds.

Director, Division of School Building Service, J. L. Graham

GEORGIA

State Superintendent of Schools, Dr. M. D. Collins, Atlanta

Furnishes plans and specifications for school-building guidance in local units.

Supervisor of schoolhouse construction prepares plans for 1- to 6-teacher buildings; prepares school ground plans; checks architects' plans; advises school officials.

Other Agencies

County superintendent and county board of education approve plans.

Supervisor of Schoolhouse Planning, W. W. Simmons

IDAHO

State Board of Education, Boise

Standardization of:
- Sanitary appliances
- School furniture
- School equipment and supplies
- School buildings

Issues plans for 1-, 2-, 3-room buildings.

Requires approval of all plans.

State Superintendent, J. W. Condie

Member of State Board of Education and its executive officer.

Other Agencies

Department of public welfare has to cooperate with state board of education in its duties regarding schools.

County superintendent has power to require local trustees to conform to rules of state board "if there is money enough."

County board of health is responsible for sanitation in schools.

ILLINOIS

State Superintendent of Public Instruction, John A. Wieland, Springfield

Prepares, with advice of state board of health, state architect, and state fire marshal, specifications for minimum requirements in heating, ventilation, lighting, seating, water supply, toilets, safety against fire.

These have force of law.

Other Agencies

State architect is required to assist the state superintendent of schools.

Enforcement of law is in the hands of county superintendents and local authorities.

County superintendent approves plans according to standards of state board.

Advises school officials in details of construction, but only on standards is it necessary to follow him.

County superintendent inspects buildings.

Board of directors and board of education required to submit plans to county superintendent.

INDIANA

State Superintendent of Public Instruction, Floyd I. McMurray, Indianapolis

Other Agencies

Local school trustees erect buildings. Plans and specifications must be submitted to state board of health for approval of sanitation and hygiene; to state board of accounts for adequacy of specifications and fair competition; and to state fire marshal for compliance with state fire laws.

State board of health issues standards.

IOWA

State Superintendent of Public Instruction, Agnes Samuelson, Des Moines

Shall prepare and publish, when deemed necessary, a pamphlet containing suitable plans and specifications.

KANSAS

State Board of Education, Topeka

"No provision in the laws to prevent the erection of undesirable buildings or to compel the discontinuance of buildings that should be abolished immediately, further than plans for all new school buildings must be submitted to the state architect as to provision for fire protection according to law." Section 421, Revised School Laws of Kansas for 1931.

Has adopted standardization of rural schools involving among other things: out-building; school-building equipment; and the school building itself.

State Superintendent of Public Instruction, W. T. Markham

Criticizes and approves plans submitted voluntarily by local authorities.

State Architect, Ray A. Coolidge

KENTUCKY

State Board of Education, Frankfort

Authorized to approve and adopt regulations for the sanitary and protective construction of public school buildings.

State Superintendent of Public Instruction, H. W. Peters

With concurrence of state board of health prepares regulations for the sanitary and protective construction of public school buildings. Prepares plans and specifications for 1- to 4-teacher public school buildings, for adoption by the state board of education. Examines and approves or disapproves plans and specifications submitted by county boards of education and graded boards of education.

Director of School Buildings and Grounds, J. W. Brooker

LOUISIANA

State Superintendent of Public Education, T. H. Harris, Baton Rouge

Approves plans which board of health regulations require submitting to him.

Other Agencies

Board of health regulations require submittal of plans to:
- Parish superintendent of schools
- State superintendent of schools
- Parish health officer

for hygienic or necessary provision for ventilation, heating, light, fire protection.

MAINE

State Commissioner of Education, Bertram E. Packard, Augusta

No school building can be built or repaired without his approval.

Provides plans for 1- to 4-room buildings free of cost.

Issues minimum requirements so that local units will be able to meet his approval of plans.

Other Agencies

No school building can be built or repaired without approval of board of health, where the expenditure is in excess of $50,000.

MARYLAND

State Board of Education, Baltimore

Elementary schools. Standardization includes grounds, buildings, lighting, heating and ventilation, library, equipment.

Has issued "Standards for School Buildings" as a guide to county superintendents.

State Superintendent of Schools, Dr. Albert S. Cook

Sites and plans must be submitted to him for approval, additions to buildings also.

After plans have been approved by the state consultant architect, the state superintendent issues certificate without which no building costing $300 or more can be erected (Sec. 30, Article 77, Annotated Code of Maryland).

Other Agencies

Plans must be submitted to state board of health for approval of sewage-disposal arrangements and plumbing.

MASSACHUSETTS

State Commissioner of Education, Dr. Payson Smith, Boston

Assistants of superintendent do much in consulting with local committees. Loan slides.

Other Agencies

Department of public safety must approve all plans.

Department of public safety issues regulations.

Director of Buildings' Inspection Division, Department of Public Safety, J. J. Carey, State House, Boston

MICHIGAN

State Department of Public Instruction, Lansing

Has issued standards.

Makes surveys, free of cost, of local situations before local board has decided what program should be, upon invitation. Provides administrative and professional leadership.

Provides complete plans and specifications free of charge for all 1- and 2-room buildings.

State Superintendent, Eugene B. Elliott

MINNESOTA

State Board of Education, St. Paul

State aid for building of consolidated schools.

Prints and distributes laws and rules governing public school buildings and sites.

State Commissioner, John Gundersen Rockwell

Examines all plans and specifications with power of approval or otherwise.

Prescribes rules for schoolhouse construction, including therein rules of the board of health relative to sanitary standards for toilets, water-supply, and disposal of sewage.

He may condemn buildings under his own or the state board of education's rules.

Other Agencies

Division of Sanitation, State Board of Health, examines and approves all school-building plans relative to water supply, sewage disposal and plumbing system.

The law authorizes county superintendent to advise local school boards in regard to buildings and ventilation, but, as a matter of fact, the county superintendent does not exercise this power. All such questions come to commissioner of education.

Director, Division of Buildings and Business Administration, I. O. Friswold

MISSISSIPPI

State Department of Education, Jackson

Has a division of school building service. This division:

Cooperates in making surveys on the effective organization of schools.

Makes surveys to determine building needs.

Outlines building programs.

Approves architects' plans and specifications for school buildings.

Furnishes free plans and specifications for some small school buildings, teachers' homes and accessory buildings.

General advisory service on school-plant planning and equipment and on the effective use of the school plant.

State Superintendent, Dr. W. F. Bond

MISSOURI

State Superintendent of Education, Jefferson City

Has prepared "Standards for Schoolhouse Planning and Construction," makes surveys of building needs, prepares and distributes plans and specifications for small buildings, aids in setting up requirements before plans are drawn for larger buildings, checks and approves all plans and specifications, maintains an advisory service on school-building insurance, school-building maintenance, including janitorial training service.

State Superintendent of Public Schools, Lloyd W. King

Other Agencies

The State Department of Public Health aids in checking the water supply.

Director of School Building Service, N. E. Viles

MONTANA

State Board of Education, Helena

Publishes a bulletin on 1- and 2-room rural buildings, containing drawings and plans.

State Superintendent of Public Instruction, Elizabeth Ireland

Plans are furnished local boards by the board of health.

NEBRASKA

State Superintendent of Public Instruction, Charles W. Taylor, Lincoln

Prepares plans and submits suggestions for school-building programs upon request, but has no authority under the law to require districts to build according to certain specifications.

NEVADA

State Department of Education, Carson City

Must prepare plans and specifications for rural schoolhouses on standard lines of school architecture as to size, lighting, heating, ventilation and general sanitation. The trustees of rural schools needing new schoolhouses shall be supplied with such plans and specifications upon request.

No public schoolhouse may be erected in any school district until the plans have been approved by the deputy superintendent of public instruction.

State Superintendent of Public Instruction, Chauncey W. Smith

NEW HAMPSHIRE

State Board of Education, Concord

State Commissioner, James N. Pringle

Interprets meaning of "suitable and sanitary" buildings for all schools. Has general authority to make regulations. Cooperates with superintendents and local school boards in planning buildings.

Recommends to state board of health investigation of unsuitable buildings.

Administrative Field Agent, Paul E. Farnum

Other Agencies

State board of health, on complaint, may condemn or order buildings improved at expense of districts.

NEW JERSEY

State Board of Education, Trenton

Advice and consent to appointment of building inspector by commissioner of education.

Approves plans which must be submitted.

Has set up a code.

State Department of Education

Has a business division with assistant commissioner of education and director of school buildings.

State Commissioner, Dr. Charles H. Elliott

May instruct county and city superintendents as to constructing schoolhouses and furnishing them.

Appoints an inspector of buildings, with advice and consent of state board of education.

Other Agencies

County superintendent has power "to note" conditions of schoolhouses, sites, etc., and advise with local boards in respect to construction, heating and ventilation, and lighting. May, with consent of commissioner of education, cause state moneys to be withheld where facilities are not in accord with legal requirements.

Local boards provide school buildings.

Commissioner of institutions and agencies shall examine and report on school buildings at request of commissioner of education.

Inspector of School Buildings

NEW MEXICO

State Superintendent of Public Instruction, H. R. Rodgers, Santa Fe

NEW YORK

State Education Department, Albany

Has a division of school buildings and grounds with a director.

Has set up standards.

Board issues a pamphlet of information for local authorities.

Makes inspections of sites and school conditions before definite action is taken by local authority.

Advises with superintendents, principals, and boards in regard to needs and best way to meet them.

Examines preliminary plans.

State Commissioner, Dr. Frank P. Graves

All plans and specifications must receive the commissioner's approval in all districts other than first and second class cities.

He cannot approve unless plans conform to laws.

No tax can be levied until plans are approved.

Director of School Buildings and Grounds Division, Joseph H. Hixson

NORTH CAROLINA

State Board of Public Instruction, Raleigh

There is a literary loan fund from which loans are made when plans are approved.

State department has a set of standards.

Has plans purchased from architects which it distributes free.

State Superintendent of Public Instruction, Clyde A. Erwin

All plans must be submitted to state superintendent for approval.

Other Agencies

Plans must also be submitted to insurance commission for approval, also to state board of health.

NORTH DAKOTA

State Superintendent of Public Instruction, Arthur E. Thompson, Bismarck

Plans must be submitted to and approved by superintendent.

OHIO

State Director of Education, E. L. Bowsher, Columbus

Other Agencies

Has a state building code (very elaborate).

All plans must be approved by chief inspector of workshops and factories, except in cities having regularly organized building inspection departments.

District health commissioner checks plans for water-supply and sanitary arrangements. State department of health may make surveys and issue orders as to these matters.

OKLAHOMA

State Superintendent of Public Instruction, John Vaughan, Oklahoma City

Prepares complete plans and specifications for the construction of all school buildings for four teachers or less, costing less than $10,000.

Makes school-building survey for all sizes of buildings.

Approves plans of all sizes, but approval is not required by law.

Other Agencies

Standard building laws.

Book of 300 plans in hands of each county superintendent in the state.

Director of Schoolhouse Planning, Frank Williams

OREGON

State Superintendent of Public Instruction, C. A. Howard, Salem

Issues booklet giving suggested plans for 1-, 2-, and 3-room school buildings. No legal provision for the approval of the state department.

Other Agencies

Plans for schools in third-class districts must be approved by county school superintendents.

County superintendents advise with the school boards relative to the construction, warming, ventilating, and arrangement of schoolhouses.

PENNSYLVANIA

State Department of Public Instruction, Harrisburg

Has a division of school buildings.

Prescribes rules and regulations and has power to take such action as it may deem expedient to promote physical and moral welfare of school children.

Department code—

Required to approve plans in 2nd, 3rd, 4th class districts.

Supervises preparation of plans in local communities if asked to do so.

Submits, if asked, suggestive sketches.

State Superintendent of Public Instruction, Lester K. Ade

Other Agencies

State code.

Art commission passes on architectural design.

Department of labor and industry passes on fire and panic protection.

Chief, Division of School Buildings, Dr. HuBert C. Eicher

RHODE ISLAND

State Director of Education, James F. Rockett, Providence

Part of the income of the permanent school fund may be apportioned by the director of education to assist towns in constructing model school buildings.

SOUTH CAROLINA

State Superintendent of Education, Dr. James H. Hope, Columbia

Division of schoolhouse planning and construction. Plans must be submitted to and approved by the director of schoolhouse planning.

The director inspects all plans and new buildings, and a certificate of approval is necessary before they can be used.

Plans and specifications and supervision of construction are furnished to small schools not employing an architect.

Other Agencies

Has a state building code.

Director of Schoolhouse Planning, S. P. Clemons

SOUTH DAKOTA

State Superintendent of Public Instruction, J. F. Hines, Pierre

Plans must be approved by him, and show heating and ventilation scheme. He assists in an advisory capacity in the planning of school buildings; he also helps boards in various ways to show their communities the needs of new buildings and additions to buildings.

TENNESSEE

State Commissioner of Education, Walter D. Cocking, Nashville

Division of schoolhouse planning furnishes working drawings and specifications for buildings up to and including four-teacher buildings. The division offers functional planning advice, and checks plans for larger buildings, where such service is requested.

TEXAS

State Board of Education, Austin

Purchases school district bonds or grants waiver for district to sell in open market.

State Superintendent, L. A. Woods

As ex officio secretary of the State Board, receives reports required by statute.

Other Agencies

School-building code.

Plans must be submitted as follows for approval: (1) in a common school district—to the county superintendent; (2) independent district and city or town—to superintendent of schools.

These agencies report to state department what they have done and transmit evidence.

State Director of School Plant Division, J. Fred Horn

Prepares plans for 1- to 6-teacher buildings, and suggestive sketches for larger buildings; advises school officials; checks architects' plans; makes school-building surveys upon invitation; visits local units upon invitation.

UTAH

Conditions reported uncertain

State Board of Education, Salt Lake City

There are two department building codes.

First is in abeyance though not exactly discarded.

They have operated under the second one 5 years.

State Superintendent of Public Instruction, C. H. Skidmore

Is required to formulate a code to govern preparation of plans by local communities.

May hire an architect to examine plans or inspect buildings.

VERMONT

State Board of Education, Montpelier

Public school buildings are standardized with "points" on buildings, grounds, equipment.

Plans "should be" submitted to state board.

Issues plans, pictures and bulletins.

State Commissioner, Francis L. Bailey

Other Agencies

Plans "must be" submitted to board of health.

VIRGINIA

State Board of Education, Richmond

Has a division of school buildings.

Prepares plans and specifications for smaller towns and cities.

Supervises construction free of charge.

Minimum standards have been set up and approved.

Cooperates with local boards in:

(a) Preparing preliminary plans.
(b) Getting out final plans.
(c) Attendance at opening of proposals.
(d) Inspection every 2 weeks during construction, additional upon request of contractor or local board.

State Superintendent of Public Instruction, Dr. Sidney B. Hall

State Director, Division of Buildings, Raymond V. Long

WASHINGTON

State Superintendent of Public Instruction, Olympia

Has been given "some power" through law on "wider use of school plant."

State Superintendent of Public Instruction, Dr. N. D. Showalter

Other Agencies

County superintendents approve plans in 3rd class districts.

WEST VIRGINIA

State Board of Education, Charleston

May require all plans and specifications for the erection of school buildings to comply with the requirements of law; and may require all county boards to submit all plans and specifications for the Board's approval.

State Superintendent of Free Schools, W. W. Trent

WISCONSIN

State Department of Public Instruction, Madison

Under a cooperative agreement between the industrial commission and the department, all school plans are sent to the latter by the commission for checking and suggestive criticisms looking towards the erection of first class buildings.

Helps local communities by suggesting plans for all types of buildings to serve as a basis for extended work by commercial architects.

Service has been extended to cover expert advice on heating, ventilation, lighting.

The department develops complete plans and specifications and gives architectural service for 1- and 2-room rural schools on request.

Inspects all types of schools with a view to improving housing conditions and facilities; makes complete building surveys in all types of communities on request.

Gives field service and makes inspection upon request.

State Superintendent of Public Instruction, John Callahan

Other Agencies

The law requires submission of all school plans to industrial commission. This checking refers primarily to the application of the state building code and pays attention primarily to construction, safety and sanitation.

Supervisor of Buildings, H. W. Schmidt

WYOMING

State Superintendent of Public Instruction, Jack R. Gage, Cheyenne

Entrusted with general supervision of the public schools of the state. The Commissioner of Education works under his direction.

Commissioner of Education

He shall prepare for the use and guidance of the district board regulations and suggestions for standardizing and grading schools and for the hygienic and sanitary building of schoolhouses and the selection of sites.

Section XVI

ARCHITECTS
FOR EDUCATIONAL BUILDINGS

All the architects listed in this Directory are now at work on educational buildings or have designed a number of school and college buildings in recent years.

No attempt has been made to evaluate the skill or professional standing of the architects listed. Boards of Education and persons interested in the construction of new buildings can obtain valuable advice in this matter from the presidents of the local chapters of the American Institute of Architects, or from the national headquarters of that organization, The Octagon, Washington, D. C., and from such sources as the National Advisory Council on School Buildings, the United States Office of Education, the respective state departments of education, the Department of Education of the National Catholic Welfare Conference, and the Department of Educational Administration of Teachers College, Columbia University, New York.

ALABAMA

Birmingham
Charles H. McCauley, Jackson Bldg.
Miller & Martin & J. A. Lewis, Title Guarantee Bldg.
Bem Price, Farley Bldg.
W. A. Rayfield & Co., 328 St. George St.
Jack B. Smith, Steiner Bldg.
M. E. Van Arman, Martin Bldg.

Gadsden
Paul W. Hofferbert, 748 Forrest Ave.

Mobile
George B. Rogers, Van Antwerp Bldg.

Montgomery
Ausfeld & Jones, Shepherd Bldg.

ARIZONA

Phoenix
Orville A. Bell, Heard Bldg.
L. M. Fitzhugh, Ellis Bldg.
Janssen & Whittlesley, Security Bldg.
Lescher & Mahoney, Title & Trust Bldg.

Tucson
Roy W. Place, 11 E. Pennington St.

ARKANSAS

Fort Smith
Haralson & Mott, Merchants Bank Bldg.

Little Rock
John P. Almand
Erhart & Eichenbaum, Gem Bldg.
A. N. McAninch, Pyramid Bldg.
Mann, Wanger & King, Donaghey Bldg.
Thompson, Sanders & Ginocchio, Hall Bldg.
Wittenberg & Delony, Southern Bldg.

Pine Bluff
Mitchell Selligman

Texarkana
Witt, Siebert & Halsey

CALIFORNIA

Alhambra
Scott Quintin, Edison Bldg.
John Walker Smart, 39 E. Main St.

Bakersfield
Charles H. Biggar, Haberfelde Bldg.
Edwin J. Symmes

Balboa Island
Donald Beach Kirby

Berkeley
John J. Donovan, 950 Parker St.
P. L. Dragon & C. R. Schmidts, 2068 Allston Way
W. H. Ratcliff, American Trust Company Bldg.

Carmel
C. J. Ryland, 543 Hatton Rd. (also in Salinas)

Chico
Chester Cole

Colton
E. Charles Parke, 657 N. 8th St.

Fresno
W. D. Coates, Rowell Bldg.
H. Rafael Lake, Pacific Southwest Bldg.

Fullerton
Harry K. Vaughn, 324 E. Wilshire St.

Healdsburg
John I. Easterly, 302 Grant St.

Hollywood
H. L. Gogerty, 6272 Yucca St.

Long Beach
Clarence N. Aldrich, 1834 Dawson Ave.
Hugh R. Davies, 430 E. Ocean Ave.
Warren Dedrick, Heartwell Bldg.
M. Eugene Durfee, Long Beach School District
James R. Friend, Laughlin Bldg.
Francis H. Gentry, Jergins Trust Bldg.
D. Easton Herrald, 732 Pine Ave.
George W. Kahrs, 1224 Linden Ave.
Edward L. Mayberry, 3910 E. 3rd St.
Roger K. Nissen, 501 Termino Ave.
Martin C. Parker, 2164 Cedar St.
Schilling & Schilling, 151 Linden Ave.
Victor E. Siebert, 120 E. 3rd St.
Raymond A. Sites, 206 E. 4th St.
Kenneth S. Wing, 501 Termino Ave.

Los Angeles
Allison & Allison, Edison Bldg.
John C. Austin & Frederic M. Ashley, 1151 S. Broadway
Richard M. Bates, Jr., 664 S. Sycamore Ave.
Edwin Bergstrom, Citizens National Bank Bldg.
Horatio W. Bishop, 901 S. Wilton Pl.
C. K. Denman, Washington Bldg.
Paul J. Duncan, 624 S. La Brea St.
Ralph C. Flewelling, 816 W. 5th St.
Elmer Grey, 816 W. 5th St. (also in Pasadena)
Myron Hunt & H. C. Chambers, 408 S. Spring St.
Arthur R. Hutchason, 816 W. 5th St.
Charles M. Hutchison, 108 W. 6th St.
Theodore R. Jacobs, 315 S. Broadway
Office of George B. Kaufmann, Union Bank Bldg.
T. C. Kistner, Architects Bldg.
Samuel E. Lunden, Rowan Bldg.
Marsh, Smith & Powell, Architects Bldg.
Albert C. Martin, Higgins Bldg.
Armand Monaco, 448 S. Hill St.
Richard J. Neutra, 234 E. Silverlake Blvd.
H. C. Newton & R. D. Murray, Architects Bldg.
Raphael A. Nicolais, 5225 Wilshire Blvd.
Llewellyn A. Parker, Architects Bldg.
Alfred W. Rea & Chas. E. Garstang, Pacific Southwest Bldg.
Frank R. Schaefer, 560 S. Main St.
Edward Cray Taylor & Ellis Wing Taylor, 803 W. 3rd St.

Eugene Weston, Jr., Architects Bldg.
Carleton Monroe Winslow, Architects Bldg.
Henry F. Withey, 407 S. Western Ave.
D. J. Witmer & L. F. Watson, 816 5th St.
Wm. Lee Woollett, 5330 Loma Linda Ave.

Palo Alto

E. M. Clark & David B. Clark, 310 University Ave.

Pasadena

Robert H. Ainsworth, Central Bldg.
Elmer Grey, 170 E. California St. (also in Los Angeles)
Frederick Kennedy, Jr., 1041 E. Green St.
Marston & Maybury, 25 S. Euclid Ave.

Petaluma

Brainerd Jones, 226 Washington St.

Rancho Santa Fe

Lillian J. Rice

Riverside

G. Stanley Wilson, 3616 Main St.

Sacramento

W. E. Coffman, Forum Bldg.
Charles S. Dean, California State Life Bldg.
Harry J. Devine, Cronan Bldg.
George C. Sellon, California State Life Bldg.

Salinas

Charles E. Butner, 630 Pajaro St.
C. J. Ryland, Salinas National Bank Bldg. (also in Carmel)

San Bernardino

H. E. Jones, Andreson Bldg.

San Diego

H. Louis Bodmer, 268 4th Ave.
Louis J. Gill, Sefton Bldg.
William Templeton Johnson, San Diego Trust & Savings Bldg.
William P. Lodge, California Bank Bldg.
Requa & Jackson, Bank of Italy Bldg.
John S. Siebert, Granger Bldg.
F. W. Stevenson, Spreckels Bldg.
William H. Wheeler, San Diego City Schools

San Francisco

Arthur Brown, Jr., 251 Kearny St.
Norman R. Coulter, 46 Kearny St.
W. P. Day, Financial Center Bldg.
O. A. Deichmann, 110 Sutter St.
Edward A. Eames, 216 Pine St.
Hyman & Appleton, 68 Post St.
George W. Kelham, California Commercial Union Bldg.
G. Albert Lansburgh, 140 Montgomery St.
Masten & Hurd, 233 Post St.
Maybeck & White, 235 Montgomery St.
Miller & Pflueger, 580 Market St.
William Mooser, 681 Market St.
E. L. Norberg, 580 Market St.
Smith O'Brien, 244 Kearny St.
John Reid, Jr., 405 Montgomery St.
Frederick H. Reimers, 233 Post St.
Resing & McGuinness, 488 Pine St.
Martin Rist, Phelan Bldg.
Charles E. J. Rogers, Phelan Bldg.
N. W. Sexton, De Young Bldg.
William H. and Harold H. Weeks, 525 Market St.

San Jose

Ralph Wyckoff, Anglo Bank Bldg.

Santa Ana

Frederick H. Eley, 109 Orange Ave.

Santa Barbara

E. Keith Lockard, 117 E. De La Guerra St.
Soule & Murphy, 116 East Sola St.

Santa Rosa

Herbert & Caulkins, Rosenberg Bldg.

South Pasadena

A. S. Nibecker, Jr., 1624 Bushnell Ave.

Stockton

Elmore G. Ernst, 9 W. Cleveland St.
Frank V. Mayo, 931 Eldorado St.

Ventura

Harold E. Burket, 468 E. Main St.

Wilmar

J. A. Larralde, 2231 Del Mar Ave.

COLORADO

Colorado Springs

Charles E. Thomas, Colorado Springs National Bank Bldg.

Denver

J. B. Benedict, 1669 Broadway
William N. Bowman, Inc., Insurance Bldg.
T. H. Buell & Co., 730 14th St.
H. W. J. Edbrooke, Tabor Bldg.
Wm. E. and Arthur A. Fisher, Denver National Bldg.
F. W. Frewen & E. C. Morris, Patterson Bldg.
Glen Huntington, C. A. Johnson Bldg.
G. Meredith Musick, Republic Bldg.
Gordon D. White, 615 Columbine St.

Montrose

J. H. Antrobus, 634 Main St.

Pueblo

Walter DeMordaunt, Thatcher Bldg.
John Gray, 612 Van Buren St.

CONNECTICUT

Bridgeport

Frederick H. Beckwith, 19 Arcade Balcony

Hartford

Isaac A. Allen & Son, Inc., 100 Farmington Ave.
S. W. Haynes & Associates, 36 Pearl St. (also in Fitchburg, Mass.)
Wm. D. Johnson, 174 Bond St.
Carl J. Malmfeldt, 36 Pearl St.
William T. Marchant, 36 Pearl St.
Mylechreest & Reynolds, 238 Palm St.
Frank Warren Whiton, 805 Main St.

Litchfield

Ernest Sibley

Meriden

Lorenzo Hamilton, Inc., 22 Church St.

Middletown

Towner & Sellew Associates, Inc., 329 Main St.

New Britain

Perry & Bishop, 17 Court St.

New Haven

R. W. Foote, 185 Church St.
George H. Gray, 6 Prospect Court
Joseph A. Jackson, 30 Whitney Ave.
Kelly & Kelly, 185 Church St.
Douglas Orr, 96 Grove St.
G. A. Quick & Schilling & Goldbecker, 98 College St.

New London

A. Graham Creighton, 140 State St.
Payne & Keefe

Waterbury

Louis A. Walsh, 69 Center St.

West Hartford

Russell F. Barker, 17 Staples Pl.

DELAWARE

Wilmington

Brown & Whiteside, DuPont Bldg.
E. W. Martin, DuPont Bldg.
Massena and DuPont, 921 Market St.
Robinson, Stanhope & Manning, Equitable Bldg.

DISTRICT OF COLUMBIA

Washington

Albert I. Cassell, Howard University
H. W. Cutler, 1108 16th St., N. W.
Waldron Faulkner, 917 15th St.
Philip H. Frohman, 726 Jackson Pl.
Frohman, Robb & Little, 726 Jackson Pl. (also in Boston)
A. B. Trowbridge, 917 15th St.
Upman & Adams, 744 Jackson Pl., N. W.

FLORIDA

Daytona Beach

Harry M. Griffin, 309 N. Grandview Ave.

Gainesville
Rudolph Weaver, University of Florida

Jacksonville
R. A. Benjamin, 21 Ocean St.
S. Ralph Fetner, 218 W. Church St.
Mellen C. Greeley, Barnett National Bank Bldg.
Mark & Sheftall, Clark Bldg.
Jefferson D. Powell, Professional Bldg.

Miami
Kiehnel & Elliott, Seybold Bldg.
Henry J. Moloney, Professional Bldg.
E. L. Robertson & Geo. Pfeiffer, Daily News Tower

Miami Beach
August Geiger, 731 Lincoln Rd.

Orlando
W. Kenneth Miller, 206 Washington Street Arcade

Pensacola
S. J. Welch, 1306 E. Jackson St.
Walker D. Willis, Blount Bldg.

St. Petersburg
Henry L. Taylor, Empire Bldg.

Stuart
Bert D. Keck, 206 Osceola Ave.

Tallahassee
Philip F. Kennard, Box 902

Tampa
Franklin O. Adams, 509 Twiggs St.
M. Leo Elliott, Inc., 415 Tampa St.
Frank A. Winn, Jr., 416 Tampa St.

GEORGIA

Atlanta
Bush-Brown, Gailey & Associates, Georgia School of Technology
Wm. J. J. Chase, 140 Peachtree St.
Daniell & Beutell, Georgia Savings Bank Bldg.
Edwards & Sayward, 101 Marietta Street Bldg.
Chas. H. Hopson & Ross H. Howard, Associate, Healey Bldg.
Ivey & Crook, Candler Bldg.
Henry H. Jordan, Healey Bldg.
R. Kennon Perry, Mortgage Guarantee Bldg.
Otis Clay Poundstone, 101 Marietta St.
Tucker & Howell, Rhodes Haverty Bldg.

Augusta
F. Arthur Hazard, 228 Masonic Bldg.
Willis Irvin, S. F. C. Bldg.
A. Brian Merry, S. F. C. Bldg.
Scroggs & Ewing, S. F. C. Bldg.

Brunswick
Francis L. Abreu, Perry Bldg.

Columbus
F. Roy Duncan, 3119 Hamilton Ave.
T. F. Lockwood

Fitzgerald
Lauren Parrott

Macon
Dennis & Dennis, 556 Mulberry St.
W. Elliott Dunwody, Jr., 460 Broadway

Savannah
Cletus W. Bergen, Liberty National Bank Bldg.
Levy & Clarke, 203 E. Broughton St.
Walter P. Marshall, 1108 E. Henry St.

Valdosta
Lloyd Greer, 108 S. Patterson St.

IDAHO

Boise
Wayland & Fennell, Box 1277

Pocatello
Frank H. Paradice, Jr., Pourtneuf Bldg.

ILLINOIS

Aurora
Frank B. Gray, 73 S. LaSalle St.

Belleville
Rubach & Weisenstein, Belleville Bank & Trust Bldg.

Berwyn
Robert M. Hyde, 3428 Maple Ave.

Bloomington
Lundeen & Roozen, Corn Belt Bank Bldg.
Schaeffer & Hooten, Peoples Bank Bldg.

Champaign
F. E. Berger & R. L. Kelley, Lincoln Bldg.
George E. Ramey & Co., Robeson Bldg.

Chicago
Armstrong, Furst & Tilton, 11 S. LaSalle St.
Gerald A. Barry, 4929 Augusta Blvd.
Burnham Brothers & Hammond, Inc., 160 N. LaSalle St.
Melville C. Chatten, 160 N. LaSalle St.
Childs & Smith, 430 N. Michigan Ave.
John C. Christensen, Board of Education, 228 N. LaSalle St.
John D. Chubb, 109 N. Dearborn St. (also in Marquette, Mich.)
Floyd E. Dougherty, 79 W. Monroe St.
N. Max Dunning, 306 S. Wabash Ave.
George G. Elmslie, 122 S. Michigan Ave.
Leonard A. Gliatto, 5748 Race Ave.
Granger & Bollenbacher, 333 N. Michigan Ave.
Hall & Stromquist, 175 W. Jackson Blvd.
Hamilton, Fellows & Nedved, 814 Tower Court
Charles Hodgdon & Son, 111 W. Monroe St.
Holmes & Flinn, 8 S. Dearborn St.
Holsman & Holsman, 140 S. Dearborn St.
Joseph C. Llewellyn Co., 38 S. Dearborn St.
Benj. Franklin Olson, 19 S. LaSalle St.
Pond, Pond & Edgar Martin, 180 N. Michigan Ave.
James B. Rezny & Adrian Rezny, 2202 S. Crawford Ave.
E. E. Roberts & Elmer C. Roberts, Inc., 82 W. Washington St.
Monroe R. Sandel, 10 E. Huron St.
Schmidt, Garden & Erikson, 104 S. Michigan Ave.
R. Harold Zook, 140 S. Dearborn St.

Danville
Liese & Ludwick, Temple Bldg.

Decatur
Aschauer & Waggoner, Citizens Bldg.
Charles Harris, Standard Life Bldg.

East St. Louis
John W. Kennedy, First National Bank Bldg.

Elgin
Leroy W. Thompson, 735 St. John St.

Elmhurst
E. Norman Brydges, 257 St. Charles Rd.

Evanston
W. Fred Dolke, Jr., 1841 Asbury Ave.
Dwight H. Perkins, 2319 Lincoln St.

Galesburg
Aldrich & Aldrich, Bondi Bldg.
Edgar A. Payne, 260 S. Seminary St.

Highland
Knoebel & Pabst, State & Trust Bank Bldg.

Highland Park
John S. Van Bergen, 234 Cedar Ave. (also in Ravinia)

Joliet
Webster Tomlinson, Morris Bldg.
Charles L. Wallace, 409 Campbell St.

Lake Forest
Anderson & Ticknor, Inc., 262 E. Deerpath Ave.

La Salle
John Hanifen

Lincoln
Deal & Ginzel, Box 406

Metropolis
S. Lester Daly

Moline
M. R. Beckstrom, Reliance Bldg.
William H. Schulzke, Fifth Avenue Bldg.

Mt. Vernon
Wm. R. McCoy, First National Bank Bldg.

Murphysboro
R. Z. Gill & Co., 1328½ Walnut St.

Niles Center
Emerson E. Raymond, 8324 Keating Ave.

Park Ridge
W. F. McCaughey, 3 S. Prospect St.

Peoria
Hamilton B. Dox, Lehmann Bldg.
Hewitt, Emerson & Gregg, Peoria Life Bldg.
Jameson & Harrison, Alliance Life Bldg.

Quincy
Martin J. Geise, 109 N. 8th St.

Rockford
Raymond A. Orput
Peterson & Johnson

Rock Island
Cervin & Stuhr, Safety Bldg.
Benj. A. Horn, Rock Island Bank Bldg.
Ed. Lerch, 2211 26th St.

Springfield
Harry J. Reiger, Security Bldg.

Urbana
Royer, Danely & Smith, Flatiron Bldg.
Smith, Kratz & Strong, 101 S. Broadway

INDIANA

Anderson
E. F. Miller, Anderson Bank Bldg.
Ernest R. Watkins, Citizens Bank Bldg.

Bedford
O. L. Hill, Box 274

Crawfordsville
Carroll O. Beeson, Ben Hur Bldg.

Crown Point
Turner & Bohling, 116 N. East St.

Dana
H. L. Fillinger, First National Bank Bldg.

East Chicago
Karl D. Norris, Calumet Bldg.

Evansville
Harry E. Boyle & Co.
Charles L. Troutman, American Trust Bldg.

Fort Wayne
Le Roy Bradley, 221 W. Wayne St.
Pohlmeyer & Pohlmeyer, Central Bldg.
A. M. Strauss, Calwayne Bldg.

Frankfort
Leonard & Wolf, 241 Ross Block

Goshen
Hubert Miller, 503 S. Main St.

Huntington
Robert W. Stevens

Indianapolis
D. A. Bohlen & Son, Majestic Bldg.
Burns & James, 333 N. Pennsylvania St.
Robert F. Daggett, Electric Bldg.
Herbert Foltz & Son, Architects Bldg.
George & Zimmerman, 3540 N. Meridian St.
Merritt Harrison, Architects Bldg.
McGuire & Shook, Fletcher Trust Bldg.
Parker & Faulstitch, Board of Trade Bldg.
Pierre & Wright, Architects Bldg.

Lafayette
Frank P. Riedel, 716 S. 12th St.
Walter Scholer, 1114 State St.

LaPorte
George W. Allen, Savings Bank Bldg.

Muncie
Houck & Hamilton, Patterson Bldg.

Notre Dame
Francis W. Kervick

Richmond
Werking & Son, 2000 E. Main St.

South Bend
Austin & Shambleau, Building & Loan Tower
R. V. & H. V. Maurer, 107 Lincolnway, E.
Callix E. Miller, Union Trust Bldg.
Ernest W. Young, Sherland Bldg.

Terre Haute
Miller & Yeager, Opera House Bldg.

Vincennes
Sutton & Routt, Citizens Trust Bldg.

IOWA

Ames
Allen Holmes Kimball, 213 Engineering Annex

Burlington
Robin B. Carswell, Iowa State Bank Bldg.

Cedar Rapids
W. J. Brown, Higley Bldg.
Norman Hatton, Higley Bldg.
H. E. Hunter, Security Bldg.
Charles B. Zalesky, Merchants National Bank Bldg.

Davenport
Kruse & Klein, Kahl Bldg.
Howard S. Muesse, Davenport Bank Bldg.

Decorah
Charles Altfillisch, 126½ W. Water St.

Des Moines
Dougher, Rich & Woodburn, Old Colony Bldg.
Keffer & Jones, Masonic Temple
Proudfoot, Rawson, Brooks & Borg, Hubbell Bldg.
Oren Thomas, Des Moines Bldg.
Tinsley, McBroom & Higgins, Hubbell Bldg.

Forest City
Thorwald Thorson

Fort Dodge
Frank W. Griffith, Snell Bldg.

Mason City
Hansen & Waggoner, 11½ S. Federal Ave.

Ottumwa
George M. Kerns, 211 E. 2nd St.

Sioux City
Beuttler & Arnold, Insurance Exchange Bldg.
Geo. B. Hilgers, Warnock Bldg.
E. R. Swanson, Insurance Exchange Bldg.

Waterloo
Mortimer B. Cleveland
C. W. Irwin, Lafayette Bldg.
Ralston & Ralston, Waterloo Bldg.

KANSAS

Emporia
Brinkman & Hagen, Citizens Bank Bldg.

Hutchinson
Otho McCrackin, 1810 N. Ash St.
Mann & Co., Rorabaugh-Wiley Bldg.
Routledge & Hertz
Smith & English

Kansas City
Peterson & Almon, 721 Minnesota Ave.
Jos. W. Radotinsky, Commercial National Bank

Lawrence
Thomas Larrick, 816½ Massachusetts St.

Manhattan
Paul Weigel, Kansas State College

Topeka
Raymond A. Coolidge, State Architect
Cuthbert & Suehrk, 735 Kansas Ave.
W. E. Glover, National Reserve Bldg.
Ralph E. Scamell, National Reserve Bldg.
Louis H. Spencer, 1119 W. 16th St.
Thomas W. Williamson, National Bank Bldg.

Wichita
Ed. Forsblom, Beacon Bldg.
Overend & Boucher, Brown Bldg.
Glen H. Thomas, 125½ N. Topeka Ave.
S. S. Voight

KENTUCKY

Frankfort
Leo L. Oberwarth & Sons, 301 W. 2nd St.

Hazard
H. A. Spaulding

Henderson
Walter S. Roberts, S. Main St.

Hopkinsville
John T. Waller, 1700 S. Virginia St.

Lexington
Obadiah Bass, 155 Walton Ave.
Wm. B. Brock, City Bank Bldg.
Frankel & Curtis, Hernando Bldg.
John T. Gillig, Walton Bldg.
Whayne W. Haffier, 414 Fayette Park
Hugh Meriwether, Walton Bldg.
John F. Wilson, 558 E. High St.

Louisville
Brinton B. Davis, Columbia Bldg.
Arthur G. Tafel, 140 S. 3rd St.

Owensboro
C. W. Kimberlin, 327½ Frederica St.

Paducah
G. Tandy Smith

Somerset
George L. Elliott, 113 N. Central Ave.

LOUISIANA

Alexandria
Charles T. Roberts, Commercial Bank Bldg.

Monroe
J. W. Smith & Associates, Ouachita Bank Bldg.

New Orleans
William R. Burk, Vincent Bldg.
Edgar A. Christy, Orleans Parish School Board
Favrot & Reed, Nola Bldg.
Moise H. Goldstein, American Bank Bldg.
Weiss, Dreyfous & Seiferth, Maison Blanche Bldg.

Shreveport
Jones, Roessle, Olschner & Wiener, Ardis Bldg.
Edward F. Neild, City Bank Bldg.
Seymour Van Os, Ricou-Brewster Bldg.

Winnsboro
John W. Baker

MAINE

Augusta
Bunker & Savage, State Trust Bldg.

Bangor
Crowell & Lancaster, 6 State St.

Ellsworth
Fred L. Strout, 12 State St.

Lewiston
Harry S. Coombs & Alonzo J. Harriman, 11 Lisbon St.

Portland
Miller & Beal, Inc., 465 Congress St.
John Calvin & John H. Stevens, 187 Middle St.
John P. Thomas, 537 Congress St.

Presque Isle
John C. Levasseur, National Bank Bldg.

MARYLAND

Baltimore
O. Eugene Adams, Roland Park
J. A. Ahlers, 4810 Roland Ave.
William W. Emmart, Union Trust Bldg.
W. H. Emory, Jr., W. Biddle St. at Charles
Clyde N. & Nelson Friz, Lexington Bldg.
Lucien E. D. Gaudreau, 9 E. Hamilton St.
Henry Powell Hopkins, 10 E. Mulberry St.
Herbert G. Jory, Munsey Bldg.
Hugh I. Kavanagh, 913 N. Calvert St.
Henry G. Perring Co., 10 W. Chase St.
Smith & May, Baltimore Trust Bldg.
Taylor & Fisher, 1012 N. Calvert St.
Lucius R. White, Jr., 10 W. Chase St.

Chevy Chase
Rossel Edw. Mitchell, 7 E. Melrose St.

Cumberland
Robert H. Hitchins, Mechanic St.

MASSACHUSETTS

Boston
Adden, Parker, Clinch & Crimp, 177 State St.
J. W. Ames & E. S. Dodge, 148 State St.
Andrews, Jones, Biscoe & Whitmore, 50 Congress St.
Harrison H. Atwood, 61 Alban St.
J. Williams Beal, Sons, 185 Devonshire St.
Robert P. Bellows, 8 Park St.
Blackall, Clapp, Whittemore & Clark, 31 West St.
Coolidge & Carlson, 89 State St.
Coolidge, Shepley, Bulfinch & Abbott, Ames Bldg.
Frank Irving Cooper Corp., 47 Winter St.
Cram & Ferguson, 248 Boylston St.
Ralph Harrington Doane, 60 Batterymarch St.
M. A. Dyer Co., 1 Beacon St.
George E. Eldridge, 234 Clarendon St.
Frohman, Robb & Little, 250 Stuart St. (also in Washington, D. C.)
J. M. Gray, 175 High St.
Chas. R. Greco, 11 Beacon St.
Harper & West, 131 State St.
John P. Heffernan, 131 State St.
Ralph Coolidge Henry, 11 Beacon St.
Hutchins & French, 11 Beacon St.
Jackson & Jackson, 44 School St.
Kilham, Hopkins & Greeley, 126 Newbury St.
Edmund I. Leeds, 263 Harrison Ave.
Leland & Larsen, Statler Bldg.
McLaughlin & Burr, 88 Tremont St.
Maginnis & Walsh, 20 Providence St.
Putnam & Cox, 114 State St.
Isidor Richmond, 248 Boylston St.
James H. Ritchie & Associates, 100 Arlington St.
Louis Warren Ross, 9 Park St.
Richard Shaw, 25 Huntington Ave.
George H. Sidebottom, 137 Newberry St.
Matthew Sullivan, 100 Boylston St.
Oscar A. Thayer, 171 Newbury St.
Wadsworth & Smith, 11 Beacon St.

Egypt
Edward I. Wilson, Tilden Rd.

Fall River
Edward M. Corbett, 49 Purchase St.
Henry Fallows, 131 Stewart St.

Fitchburg
S. W. Haynes & Associates, Main St. (also in Hartford, Conn.)

Greenfield
Bernhard Dirks, 278 Main St.

Haverhill
Morse, Dickinson & Goodwin, 25 Washington Sq.

Lawrence
Office of James E. Allen, 351 Essex St.

Leominster
Harold E. Mason, 15 Prospect St.

Lowell
Perley F. Gilbert, 53 Central St.
Henry L. Rourke, 45 Merrimack St.

Lynn
George A. Cornet, 14 Central Ave.

Marblehead
William H. Quiner

New Bedford
Brown & Poole, 688 Pleasant St.

Pittsfield
Harding & Seaver, 126 Fenn St.

Shelburne Falls
Arthur E. Eldridge, 119 Main St.

Somerset
Israel J. Almy, Read St.

Springfield
D. R. Baribault, 166 Buckingham St.
Gardner & King, 33 Lyman St.
Morris W. Maloney, 49 Washington Rd.

Wellesley
William B. Brainerd, 10 Upland Rd.

Westfield
Malcolm B. Harding, 6 Main St.
Ralph M. Sizer, 12 Elm St.

West Springfield
Paul Beekman Johnson, 35 Memorial Ave.

Worcester
Lucius W. Briggs Co., 314 Main St.
Theodore J. Brodeur, 18 Cutler St.
Edwin T. Chapin, 311 Main St.
Frank H. Cutting, 29 Pearl St.
Frost, Chamberlain & Edwards, Slater Bldg.
Harry L. Meacham Associates, 120 Front St.
O. E. Nault & Sons, 48 Hamilton St.
Jasper Rustigian, 16 Norwich St.

MICHIGAN

Ann Arbor
Fry & Kasurin, First National Bank Bldg.

Battle Creek
Lewis J. Sarvis, Bromberg Bldg.

Bay City
Joseph C. Goddeyne, Bay City Bank Bldg.

Detroit
Robert O. Derrick, Inc., Union Guardian Bldg.
J. Ivan Dise, 2631 Woodward Ave.
Giffels & Vallet, Inc., Marquette Bldg.
George J. Haas, 601 E. Grand Blvd.
Austin A. Howe, 144 N. Marlborough St.
Arthur K. Hyde, 3105 E. Grand Blvd.
Albert Kahn, Inc., New Center Bldg.
Louis Kamper, Inc., Book Tower
H. T. Keyes, Free Press Bldg.
Lane-Davenport-Meyer, Donovan Bldg.
Lyndon & Smith, Robert Oakman Bldg.
McGrath & Dohmen, 3648 Mt. Elliott St.
Malcolmson & Higginbotham, 1217 Griswold St.
George D. Mason & Co., 409 Griswold St.
G. M. Merritt & Lyle S. Cole, 1111 Collingwood Ave.
O'Dell & Rowland, 90 Stimson St.
George L. W. Schulz, Board of Education, 1354 Broadway
Smith, Hinchman & Grylls, Inc., Marquette Bldg.
N. Chester Sorensen, Industrial Bank Bldg.
Alex Linn Trout, Penobscot Bldg.
B. C. Wetzel & Co., Dime Bank Bldg.

Grand Rapids
Roger Allen, Grand Rapids National Bank
Knecht, McCarty & Thebaud, 154 Louis St.
Harry L. Mead, Michigan Trust Bldg.
Henry H. Turner, Murray Bldg.

Howell
Max A. Musch, 122½ W. Grand River St.

Iron Mountain
F. E. & G. F. Parmelee, First National Bank

Jackson
Claire Allen & Sons, Dwight Bldg.
Kressbach and Frost, 407 S. Jackson St.

Kalamazoo
LeRoy & Newlander, Pratt Bldg.
Stewart-Kingscott Co., 204 Elm St.

Lansing
Lee Black & Kenneth C. Black, Capitol Savings & Loan Bldg.
Bowd & Munson, Wilson Bldg.
Warren S. Holmes Co., Olds Tower Bldg.

Marquette
John D. Chubb, 412 Nester Block (also in Chicago)

Menominee
Derrick Hubert, Sheridan Rd.

Muskegon
Vanderwest & Childs, 201 Montgomery Block

Omena
R. L. Bauer, Box 12

Port Huron
Walter H. Wyeth, Peoples Savings Bank Bldg.

Saginaw
Cowles & Mutscheller, 240 Goff Bldg.
Frantz & Spence, 118 N. Washington Ave.

St. Johns
R. V. Gay

MINNESOTA

Duluth
A. Reinhold Melander, Phoenix Bldg.
P. M. Olsen, 4203 Robinson St.
Thomas J. Shefchik, Glencoe Bldg.
C. H. Smith, Torrey Bldg.

Eveleth
E. H. Berg, First National Bank Bldg.

Hibbing
J. C. Taylor, 313½ Howard St.

Mankato
Pass & Rockey, Jackson St.
Ernest H. Schmidt, Coughlan Bldg.

Minneapolis
P. C. Bettenberg, Inc., Metropolitan Life Bldg.
E. B. Croft, 1004 Marquette Ave.
Jacobson & Jacobson, Sexton Bldg.
Lang & Raugland, Essex Bldg.
Charles F. Leighton, Roanoke Bldg.
Pesek & Shifflet, 914 Marquette Ave.
Stebbins, Haxby & Bissell, 1111 Nicollet Ave.
Sund & Dunham, Essex Bldg.

Moose Lake
Frederick A. Schweiger

New Ulm
Albert G. Plagens, 300 N. State St.

Rochester
Harold H. Crawford

St. Cloud
Nairne W. Fisher, St. Mary's Bldg.
Louis Pinault, Granite Exchange Bldg.

St. Paul
William L. Alban, 885 Portland Ave.
Carl H. Beutow, 624 University Ave.
Thomas F. Ellerbe & Co., Minnesota Bldg.
Ray R. Gauger & Co., New York Bldg.
William M. Ingemann, Globe Bldg.
Clarence H. Johnston, 360 Robert St.
Toltz, King & Day, Inc., Pioneer Bldg.

Winona
Boyum, Schubert & Sorenson, 117 W. 3rd St.

MISSISSIPPI

Gulfport
Shaw & Woleben, Durham Bldg.
Shourds & Bean, Hewes-Martin Bldg.
Vinson B. Smith, Jr.

Hattiesburg
E. C. Hearon & Sons, Carter Bldg.

Jackson
Frank P. Gates Co., Millsaps Bldg.
Hull & Drummond, Capitol & State Sts.
E. L. Malvaney, Tower Bldg.
R. W. Naef, Millsaps Bldg.
N. W. Overstreet & Town, Standard Life Bldg.
James M. Spain, Merchants Bank Bldg.

Meridian
Krouse & Brasfield, Kidder Bldg.
Burt Stuart, 1401 24th Ave.

Picayune
Wilfred S. Lockyer

Starkville
Stevens & Johnston (also in Corinth)

Vicksburg
Wm. A. Stanton, 1220 Finez St.

MISSOURI

Cape Girardeau
A. F. Lindsay, H. and H. Bldg.

Independence
Hal E. Wheelock, 218 E. Short St.

Jefferson City
John M. Schaper, Central Trust Bldg.

Kansas City
Samuel W. Bihr, Jr., 220 E. Winthrop Rd.
Ernest O. Brostrom, 3725 Valentine Rd.
Maurice Carroll, R. A. Long Bldg.
Felt, Dunham & Kriehn, 300 W. 47th St.
Edward M. Fuller, 1012 Baltimore Ave.
Greenebaum, Hardy & Schumacher, 410 Scarritt Arcade
Frederick C. Gunn, National Fidelity Life Bldg.
Edgar P. Madorie, 206 Westover Rd.
H. D. Pampel, Finance Bldg.
Sayler & Owen, 1207 Grand Ave.
Joseph B. Shaughnessy, Reliance Bldg.
Chas. A. Smith, Finance Bldg.

Moberly
Ludwig Abt

St. Joseph
Eckel & Aldrich, Corby Bldg.
Eugene R. Meier, Bartlett Trust Bldg.

St. Louis
George Barnett, Syndicate Trust Bldg.
Bonsack & Pearce, Inc., 411 Olive St.
Marcel Boulicault, Ambassador Bldg.
Dreisoerner & Leech, 3828 Arsenal St.
Ernest T. Friton, Security Bldg.
Henry P. Hess, 411 N. 7th St.
Wm. B. Ittner, Inc., 911 Locust St.
Jamieson & Spearl, Arcade Bldg.
Johnson & Maack, Chemical Bldg.
La Beume & Klein, 315 N. 7th St.
O'Meara, Hills & G. E. Quick Associate, 5709 Waterman Blvd.
George W. Sanger, 911 Locust St.
Joseph H. Senne, Maryland Heights
O. W. Stiegemeyer, 4817 Oleatha Ave.
Study & Farrar, Arcade Bldg.

Springfield
Heckenlively & Mark, Landers Bldg.
Dan R. Sandford, 1362 Benton Ave.

MONTANA

Billings
J. G. Link, Inc., Electric Bldg.
McIver & Cohagen, Hedden Bldg.
Edwin G. Osness, 11 Alderson Ave.
William H. Reid, Jr., 1140 N. 30th St.

Bozeman
Fred F. Willson, Box 497

Great Falls
Bird & van Teylingen, Medical Arts Bldg.
Cottier & Herrington, First National Bank Bldg.
George H. Shanley

Havre
Frank F. Bossout, 133 4th Ave.

Helena
Hugenin & De Kay, 440 N. Benton Ave.

Kalispell
Fred A. Brinkman, Whipps Block

Missoula
H. E. Kirkemo, Lehsou Block

NEBRASKA

Fremont
George Grabe, 304 E. 6th St.

Grand Island
Gordon Shattuck, Clinic Bldg.

Hastings
Marcus L. Evans, Cameron Bldg.
K. H. Gedney Co.

Kearney
J. P. Helleberg, Central Ave.
Hugh M. McClure

Lincoln
Davis & Wilson, 525 S. 13th St.
Meginnis & Schaumberg, Federal Trust Bldg.
J. F. Reynolds, 1637 S. 11th St.

Norfolk
James C. Stitt, Norfolk National Bank

North Platte
C. C. Coursey, Neville Bldg.

Omaha
N. R. Brigham, 5404 Western Ave.
Everett S. Dodds, 5011 N. 22nd St.
Lahr & Stangel, W. O. W. Bldg.
John Latenser & Sons, Inc., Saunders-Kennedy Bldg.

NEVADA

Las Vegas
A. L. Worswick, 115 Carson St.

Reno
F. J. DeLongchamps, Gazette Bldg.

NEW HAMPSHIRE

Concord
Harold Holmes Owen, Inc., 3 N. State St.

Dover
J. Edward Richardson, 56 Grove St.

Durham
E. T. Huddleston

Enfield
William C. Hough, Box 333

Hanover
Jens Fredrick Larson, 27 E. Wheelock St.
Wells, Hudson & Granger, Main St.

Laconia
Norman P. Randlett, 614 Main St.

NEW JERSEY

Asbury Park
Ernest A. Arend (also in New York)

Atlantic City
V. B. Smith, Inc., 1305 Atlantic Ave.

Camden
Byron H. Edwards, West Jersey Trust Bldg.
Joseph Norman Hettel, 720 Federal St.
F. Herbert Radey, 101 N. 7th St.

Elizabeth
Leslie M. Dennis, 333 N. Broad St.
C. Godfrey Poggi, 275 Morris Ave.
Lauren V. Pohlman, 80 Broad St.

Englewood
Lawrence C. Licht, 19 Knickerbocker Rd.

Fort Lee
Hacker & Hacker, Fort Lee Trust Bldg.

Hackensack
Arthur E. Dore, 398 Main St.

Irvington
Victor H. Strombach, 1243 Springfield Ave.

Jersey City
Hugh A. Kelly, 921 Bergen Ave.

Morristown
Arnold V. Cook, 31 Park Pl.
Walter Slifer, 10 Park Pl.
Oscar B. Smith, 59 Franklin St.
Campbell Voorhees, Schuyler Pl.

Newark
Charles F. Ackerman, 45 Clinton St.
J. Frederick Cook, 9 Clinton St.
Guilbert & Betelle, 20 Branford Pl.
Nathan Myers, 24 Walnut St.

New Brunswick
Alexander Merchant & Son, 1 Elm Row

Passaic
Kelly & Struyk, 157 Prospect St.

Paterson
Fanning & Shaw, 49 Ward St.
Lee & Hewitt, 152 Market St.
Wentworth & Vreeland, 140 Market St.

Perth Amboy
John Noble Pierson & Son, 313 State St.

Plainfield
Ernest T. Brown, 201 E. 5th St.

Princeton
Rolf William Bauhan, 90 Nassau St. (also in New York)

Red Bank
Vincent J. Eck, Zobel Bldg.

Ridgefield
Watson & Licht, 19 Van Courtland Pl.

Teaneck
John H. Liebau, 191 Larch Ave.
B. Francis McGuire, 705 Linden Ave. (also in New York)

Toms River
J. G. Phillips, 509 Main St.

Trenton
Harry A. Hill, Broad Street Bank Bldg.
Herman L. Mack, 2428 Liberty St.

West New York
William Mayer, Jr., 711 Bergenline Ave.

NEW MEXICO

Albuquerque
Brittelle & Ginner, K. of P. Bldg.

Roswell
C. R. Carr & Co., Box 28

Santa Fe
John Gau Meem, Box 628

NEW YORK

Albany
Andrew L. Delehanty, 450 Ontario St.
H. O. Fullerton, 152 Washington Ave.
James A. Galvin, 11 N. Pearl St.
Thomas L. Gleason, 15 Carroll Terr.
Galen H. Nichols, 93 State St.
Pember & Demers, 24 James St.
Marcus T. Reynolds, 100 State St.
J. Russell White, 109 State St.

Amsterdam
Howard F. Daly, 15 E. Main St.
Leland Henry Niles, 365 Guy Park Ave.

Auburn
Wallace P. Beardsley, Seward Block

Binghamton
Conrad & Cummings, 99 Collier St.
Raymond W. Jewell, 64 West End Ave.
A. T. Lacey & Sons, 52 Exchange St.
Walter H. Whitlock, 609 Chenango St.

Brooklyn
Henry V. Murphy, 208 Livingston St.

Buffalo
Frederick C. Backus & Charles E. Mott, 360 Delaware Ave.
Bley & Lyman, 505 Delaware Ave.
Edward B. Green & Son, 1 Niagara Square
Harbach & Kideney, 259 Delaware Ave.
Albert H. Hopkins, Liberty Bank Bldg.
Hudson & Hudson, 34 Dun Bldg.
F. J. & W. A. Kidd, 524 Franklin St.
Daniel G. McNeil, 816 City Hall
Aaron Riley Merritt, Erie County Bank Bldg.
Roswell E. Pfohl, 204 W. Huron St.
Townsend & McNeil, Dun Bldg.

Cortland
Carl W. Clark

Elmira
Pierce & Bickford, 215 W. Water St.

Glens Falls
Milton Lee Crandall, 200 Glen St.

Gloversville
W. Brown Van Dreser, 31 W. Fulton St.

Harrison
Robert P. Vignola, 231 Harrison Ave.

Hempstead
McCullough & Johnke, 250 Fulton Ave.

Herkimer
R. E. Sluyter, First National Bank Bldg.

Hewlett
Lawrence J. Lincoln, 1185 Franklin Ave.

Jamaica
W. H. Spaulding, 163 Jamaica Ave.

Jamestown
Beck & Tinkham, Bailey Bldg.
Raymond A. Freeburg, 1105 W. 3rd St.
Oliver R. Johnson, Fenton Bldg.

Middletown
Robert R. Graham, 25 Prospect St.
E. P. Valkenburgh, 7 Linden Ave.

New York
Frederick L. Ackerman, 25 W. 44th St.
Adams & Prentice, 15 W. 38th St.
Grosvenor Atterbury, 139 E. 53rd St.
Rolf William Bauhan, 101 Park Ave. (also in Princeton, N. J.)
Wesley Sherwood Bessell, 16 E. 52nd St.
George A. Boehm, 2 W. 45th St.
Clarence Wilson Brazer, 244 Madison Ave. (also in Chester, Pa.)
F. Nelson Breed, 25 W. 45th St.
Frank Burkhard, 640 Rosedale Ave.
Alfred Busselle, 347 Madison Ave.
Coffin & Coffin, 125 E. 46th St.
Corbett & MacMurray, 130 W. 42nd St.
Delano & Aldrich, 126 E. 38th St.
Anthony J. DePace, 151 W. 46th St.
Division of Architecture, 80 Centre St.
William F. Dominick, 522 5th Ave.
F. Ferdinand Durang, 238 E. 47th St.
Randolph Evans, 140 Nassau St.
Wm. Gehron, 101 Park Ave.
Archibald F. Gilbert, 358 5th Ave.
Cass Gilbert, Inc., 244 Madison Ave.
Alfred Morton Githens, 101 Park Ave.
William H. Gompert, 40 E. 49th St.
Goodwillie & Moran, 366 W. 126th St.
W. K. Harrison, 30 Rockefeller Plaza
Hart & Shape, 247 Park Ave.
Edward Shepard Hewitt, 607 5th Ave.
Charles H. Higgins, 101 Park Ave.
John Mead Howells, 156 E. 46th St.
Thomas H. Irving, 15 Park Row
Louis F. Jallade, 597 5th Ave.
Knappe & Morris, 192 Lexington Ave.
Archibald G. Lamont, 156 5th Ave.
Joseph M. Lawlor, 15 W. 38th St.
William Lescaze, 211 E. 48th St.
John M. Liptak, 36 W. 44th St.
Electus D. Litchfield, 578 Madison Ave.
Lowinson & Todaro, 29 W. 26th St.
William Orr Ludlow, 101 Park Ave.
W. Philip McGovern, 156 E. 42nd St.
B. Francis McGuire, 466 Lexington Ave. (also in Teaneck, N. J.)
McKim, Mead & White, 101 Park Ave.
Frederick Mathesius, 101 Park Ave.
Merrill, Humble & Taylor, 23 E. 26th St.
Charles B. Meyers, 31 Union Sq., W.
Morris & O'Conner, 101 Park Ave.
George Nichols, 144 E. 30th St.
Charles A. Platt-William & Geoffrey Platt, 101 Park Ave.
John Russell Pope, 542 5th Ave.
George B. Post & Sons, 101 Park Ave.
Rasmussen & Wayland, 45 W. 45th St.
Robert J. Reiley, 12 E. 41st St.
James Gamble Rogers, Inc., 156 E. 46th St.
Rossiter & Muller, 15 W. 38th St.
Walter S. Schneider, 101 Park Ave.

Edward I. Shire, 373 4th Ave.
Shreve, Lamb & Harmon, 11 E. 44th St.
Smith & Ward, 100 E. 42nd St.
John Joseph Stanton, 160 5th Ave.
Starrett & Van Vleck, 267 5th Ave.
Gustave E. Steinback, 157 W. 74th St.
Stoughton, Stoughton & Norman H. Hunt, 156 E. 42nd St.
Thompson, Holmes & Converse, 101 Park Ave.
Tooker & Marsh, 101 Park Ave.
William Van Alen & Harold Werner, 141 E. 52nd St.
John V. Van Pelt, 15 E. 40th St. (also in Patchogue)
T. Visscher & J. Burley, 51 E. 42nd St.
D. Everett Waid, 1 Madison Ave.
F. B. & A. Ware, 1170 Broadway
Edgar I. Williams, 1 Park Ave.

Niagara Falls
Chester R. Phelps, Gluck Bldg.

North Tonawanda
Johnstone & Eggert

Olean
A. W. E. Schoenberg, 31 Hamilton Ave.

Plattsburg
Alvin Inman

Port Jefferson
Daniel Perry, 1213 Main St.

Poughkeepsie
Edward C. Smith, 39 Market St.

Richfield Springs
Myron A. Jordan, Main St.

Riverdale-on-Hudson
Dwight James Baum

Rochester
Carl C. Ade, 52 James St.
Lewis J. Brew, 277 Alexander St.
Charles A. Carpenter, Genesee Valley Trust Bldg.
Dryer & Dryer, 2550 East Ave.
William G. Kaelber, 311 Alexander St.
George F. Lorenz, 3086 St. Paul Blvd.
Francis R. Scherer, 13 S. Fitzhugh St.
Smith & Stickney, 154 East Ave.

Rome
Frank W. Kirkland, 131 W. Liberty St.

Schenectady
R. L. Bowen, 207 State St.
J. M. Ryder, 122 Jay St.

Syracuse
Melvin L. & Harry A. King, Denison Bldg.
Randall & Vedder, Sedwick, Andrews & Kennedy Bldg.
D. Kenneth Sargent, Starrett-Syracuse Bldg.
Wright & Ellis, City Bank Bldg.

Utica
Bagg & Newkirk, 258 Genesee St.
Edward J. Berg, Berg Bldg.

Valley Stream
Frederic P. Wiedersum, 240 Rockaway Ave.

Watertown
Lansing, Greene & Bisnett, Northern New York Trust Bldg.
Albert M. Skinner, 228 Arsenal St.

Westport
Quentin F. Haig

White Plains
E. Dean Parmelee, 110 Mamaroneck Ave.

Wyandanch
Hugo H. Avolin, Belmont Ave.

Wyoming
Bryant Fleming

Yonkers
William Henry Jones, 26 Main St.

NORTH CAROLINA

Asheville
Ronald Green Ltd., Arcade Bldg.

Charlotte
M. R. Marsh, Builders Bldg.

Durham
Atwood & Weeks, Trust Bldg.
George Watts Carr

Gastonia
Hugh E. White, 207 W. 4th Ave.

Greensboro
Harry Barton, Jefferson Standard Bldg.
W. L. Brewer, 225½ S. Elm St.
C. C. Hartmann

Henderson
Eric G. Flannagan, 215 Young Ave.

Hendersonville
Erle G. Stillwell

Hickory
Q. E. Herman, 13th Ave.

High Point
Eccles D. Everhart, Box 1551

Kinston
A. Mitchell Wooten, 114½ E. Gordon St.

Leaksville
James W. Hopper

Raleigh
Wm. Henley Deitrick, 102 W. Hargett St.
James A. Salter, 118 S. Dawson St.

Wilmington
Leslie N. Boney, 221 S. 5th St.

Winston Salem
Harold Macklin, Reynolds Bldg.
Northup & O'Brien, Reynolds Bldg.

NORTH DAKOTA

Bismarck
Ritterbush Bros., 209 N. 7th St.

Devils Lake
Marshall & Fisher

Fargo
Braseth & Houkom, Black Bldg.
William F. Kurke, 1117 13th Ave., N.
Joseph E. Rosatti, 117 Broadway

Grand Forks
Joseph Bell DeRemer, 1610 Veits Ave.
Theodore B. Wells, 1006 Chestnut St.

Jamestown
Gilbert R. Horton, City Hall Bldg.

Minot
G. H. Bugenhagen
Hess & Deeter, First Avenue Bldg.
E. W. Molander
Ira L. Rush

OHIO

Akron
M. M. Konarski, Board of Education
Kraus & Helmkamp, 275 W. Market St.
Lauer & Huff, 31 N. Summit St.

Bowling Green
S. P. Stewart & Son, W. Wooster St.

Bucyrus
William Unger, Box 545

Canton
Charles E. Firestone, 1342 Cleveland Ave., N.

Cincinnati
Charles Frederick Cellarius, St. Paul Bldg.
Gustave W. Drach, Inc., Union Trust Bldg.
Garriott & Becker, 15 E. 8th St.
Grunkemeyer & Sullivan, 3717 Eastern Ave.
Samuel Hannaford & Sons, Dixie Terminal Bldg.
Hunt & Allan, Eagle Savings Bldg.

E. C. Landberg, 114 Garfield Pl.
Matthews & Denison, 514 Main St.
J. A. Nardini, 111 E. 4th St.
Potter, Tyler & Martin, 35 E. 7th St.
Edward J. Schulte, Paramount Bldg.
John F. Sheblessy, 1202 Republic St.
Tietig & Lee, 34 W. 6th St.
C. C. & S. K. Weber, Inc., 111 E. 4th St.

Cleveland

Junior W. Everhard, 9219 Clifton Blvd.
Garfield, Harris, Robinson & Schafer, National City Bldg.
The Hubbell & Benes Co., 4500 Euclid Ave.
Maier & Walsh, 3868 Carnegie Ave.
Harlen F. Shimmin, Bulkley Bldg.
F. W. Striebinger & James H. Young, 1900 Euclid Ave.
Warner & Mitchell, Buckley Bldg.
Jos. L. Weinberg, 1836 Euclid Ave.

Columbus

E. W. Austin, 17 S. High St.
F. F. Glass, 186 E. Broad St.
Harsh & Davies, 145 N. High St.
Edward Kromer, Board of Education, 270 E. State St.
Richards, McCarty & Bulford, 584 E. Broad St.
F. S. Rusk, 35 E. Main St.
Howard Dwight Smith, 203 E. Broad St.
Samuel F. Swales, 142 E. Northwood Ave.

Dayton

Rollin E. Gebhart, Miami Savings Bldg.
Hermann & Brown, Reibold Bldg.
Schenck & Williams, Third National Bldg.
Walker & Norwick, American Bldg.

East Cleveland

William Koehl, 1816 Wellesley St.

Hamilton

George W. Barkman, 20 N. Sixth St.
Frederick G. Mueller & Walter R. Hair, Hotel Hamilton

Hillsboro

Henry R. Ervin, 114 N. High St.

Lima

Hulsken & Strong, Savings Bldg.
Thomas D. McLaughlin & Associates, Dominion Bldg.

Mansfield

Althouse & Jones, Farmers Bank Bldg.
Harry J. Brumenshenkel, Walpark Bldg.

Mt. Vernon

J. E. Lewis, 108 S. Main St.

Nelsonville

William Mills, 241 Washington St.

New Philadelphia

Office of Charles J. Marr, N. Broadway

Norwalk

Granville E. Scott, Citizens Bank Bldg.

Piqua

Charles Fitch Bowdle, Orr-Flesh Bldg.

Steubenville

Fred H. Clarke, National Exchange Bank Bldg.

Tiffin

Troxel, Pahl & Porter, Laird Bldg.

Toledo

Edwin M. Gee, Board of Education
Jokel & Coy, 320 Ontario St.
Mills, Rhines, Bellman & Nordhoff, Inc., 718 Jefferson Ave.

Warren

Keich & O'Brien, Union Bank Bldg.

Youngstown

Paul Boucherle & Myron N. Goodwin, Union National Bank Bldg.
Clarence A. Kissinger, 2141 Market St.
Otto J. Kling, 314 N. Phelps St.
M. Gilbert Miller, 12 W. Madison Ave.

OKLAHOMA

Ada

Albert S. Ross, American Bldg.

Ardmore

J. B. White & Son, 902 B. St., N. W.

Bartlesville

Arthur Gorman, 301½ Johnstone St.

Chickasha

Paul Harris, Oklahoma National Bank Bldg.

Enid

R. W. Shaw, Bass Bldg.

Muskogee

L. L. Howenstine, Manhattan Bldg.

Norman

Harold Gimeno, 800 Elm Ave.
Joe E. Smay, University of Oklahoma

Oklahoma City

Leonard H. Bailey, Colcord Bldg.
C. F. Drury, 3326½ Classen St.
Hicks & Moore, Cotton Exchange Bldg.
Layton, Hicks & Forsyth, Braniff Bldg.
J. O. Parr, Hales Bldg.
Dr. Haskell Pruett, State Capitol
Walter T. Vahlberg, 1222 N. Broadway Pl.

Ponca City

G. J. Cannon, Community Bldg.

Tulsa

John Duncan Forsyth, 115 E. 18th St.
Leon B. Senter, Philtower Bldg.
L. Shumway, Alexander Bldg.

OREGON

Ashland

William Laing, 762 B. St.

Baker

Wallace Landreth, Baker Loan & Trust Bldg.

Eugene

Graham B. Smith, Register-Guard Bldg.

Klamath Falls

Howard R. Perrin, Underwood Bldg.

Portland

John V. Bennes, Lewis Bldg.
L. L. Dougan, Studio Bldg.
A. E. Doyle & Associate, Pacific Bldg.
C. N. Freeman Co., Concord Bldg.
Harry A. Herzog, Inc., Guaranty Bldg.
Francis B. Jacobberger, McKay Bldg.
George H. Jones, Woodlark Bldg.
Knighton & Howell, U. S. National Bank Bldg.
Lawrence, Holford & Allyn, Failing Bldg.
F. Marion Stokes, Terminal Sales Bldg.
Lee A. Thomas, Weatherly Bldg.
Tourtellotte & Phillips, Postal Bldg.
Whitehouse & Church, Railway Exchange Bldg.

Salem

Lyle P. Bartholemew, U. S. National Bank Bldg.

PENNSYLVANIA

Allentown

Jacoby & Everett, Commonwealth Bldg.
Ruhe & Lange, 12 N. 6th St.

Altoona

Hunter & Caldwell, 3601 5th Ave.

Ardmore

Henry L. Reinhold, Jr., 127 Coulter Ave.
Ralph E. White, 221 Kent Road

Bradford

Thomas K. Hendryx, I. O. O. F. Bldg.

Canonsburg

George W. Brugger, First National Bank Bldg.

Carlisle

Bobb & Bixler, 52 E. High St.

Charleroi

J. C. Brenton, First National Bank Bldg.

Chester
Clarence Wilson Brazer, 421 Market St. (also in New York)

Donora
Conrad C. Compton, 4th St. and Thompson Ave.

Doylestown
A. Oscar Martin & Son, Hart Bldg.

Du Bois
Russell G. Howard

Easton
E. H. Wenzelberger, 34 N. 2nd St.

Ellwood City
B. J. McCandless, 239 4th St.

Erie
Fred A. Fuller, Commerce Bldg.
J. Howard Hicks, 943 W. 9th St.
Clement S. Kirby, Commerce Bldg.

Esterly
Weidner & Adams

Greensburg
P. A. Bartholemew, First National Bank Bldg.
C. H. Sorber, First National Bank Bldg.

Harrisburg
C. D. Hasness, 222 Market St.
Miller I. Kast & Thomas M. Kelker, 222 Market St.
Lawrie & Green
Joseph Lesher Steele, 23 N. 3rd St.

Homestead
Adam G. Wickersham, 135 E. 8th Ave.

Indiana
Fred P. Sprankle, 366 N. 9th St.

Irwin
Robert J. Brocker, Box 72

Jenkintown
Carswell, Berninger & Bower, 304 York Rd.

Johnstown
H. B. Raffensperger, Johnstown Trust Bldg.
O. P. Thomas, 502 Main St.

Kittanning
Tillman Scheeren, Jr., Boarts Bldg.

Lancaster
Henry Y. Shaub, 20½ N. Queen St.
C. Emlen Urban, Woolworth Bldg.

McKeesport
C. R. Moffitt, Masonic Temple

Moylan
William McKee Walton, Box 163

New Castle
W. G. Eckles Co., Lawrence Savings & Trust Bldg.
The Thayer Co., Greer Bldg.

Oil City
W. Holmes Crosby, Beers Bldg.

Philadelphia
W. Pope Barney & Roy W. Banwell, 1805 Walnut St.
Wesley Lesher Blithe, 1524 Chestnut St.
Arthur H. Brockie, Architects Bldg.
Horace W. Castor, Architects Bldg.
Irwin T. Catharine, Parkway at 21st St.
Henry D. Dagit & Sons, 1329 Race St.
Davis & Dunlap, 1805 Walnut St.
De Armond, Ashmead & Bickley, Commercial Trust Bldg.
Folsom & Stanton, Architects Bldg.
Gondos & Gondos, Architects Bldg.
Francis A. Gugert, Architects Bldg.
Heacock, Hokanson-C. A. Scheuringer, 1211 Chestnut St.
Virgil L. Johnson, 21st & Winter Sts.
Karcher & Smith, 1520 Locust St.
Charles Z. Klauder, 1429 Walnut St.
W. H. Lee, 1505 Race St.
MacKenzie & Blew, Otis Bldg.
Emile G. Perrot, 1405 N. 16th St.
Ritter & Shay, Packard Bldg.
Savery & Scheetz, Stephen Girard Bldg.
H. Rex Stackhouse, 1610 Spruce St.
Harry Sternfeld, Architects Bldg.
Stewardson & Page, 315 S. 15th St.
Sundt, Wenner & Fink, 1701 Arch St.
Tilden, Register & Pepper, 1608 Walnut St.
Simon Wassermann, 136 S. 4th St.
Frank R. Watson, Edkins & Thompson, Architects Bldg.
Zantzinger & Borie, Architects Bldg.

Pittsburgh
Francis A. Berner, 622 E. Ohio St.
Press C. Dowler, Century Bldg.
Joseph Hoover, Storr Bldg.
J. Lawrence Hopp, 508 3rd Ave.
Kaiser, Neal & Reid, 324 4th Ave.
Albert George Lowe, Commonwealth Building Annex
Maximilian Nirdlinger, Empire Bldg.
William Richard Perry, 2882 W. Liberty Ave.
John H. Phillips, Wabash Bldg.
Prack & Prack, 119 Federal St.
Thomas Pringle-Oliver J. Robling, 217 9th St.
Schwab & Palmgreen, Koppers Bldg.
James T. Steen & Sons, 323 4th Ave.
A. N. Steinmark, Empire Bldg.
Robert Maurice Trimble, Commonwealth Building Annex
Harry Viehman, Chamber of Commerce Bldg.
W. Ward Williams, 323 4th Ave.
Eric Fisher Wood & Co., 233 Oliver Ave.

Pottsville
Phillip G. Knobloch & D. H. Grootenboer, 1811 W. Market St.

Reading
William H. Dechant & Sons, 632 Washington St.
G. C. Freeman, 419 Carsonia Ave.
W. Marshall Hughes, 147 N. 5th St.
Muhlenberg, Yerkes & Muhlenberg, 5th & Walnut Sts.
Ritcher & Eiler, 147 N. 5th St.
Scholl & Richardson, 110 S. 10th St.
Calvin H. Young, 226 N. 6th St.

Sayre
Harry C. Child, S. Keystone Ave.

Scranton
Arthur P. Coon, Union Bank Bldg.
Lester Merritt Davis, Rehrig Bldg.
Davis & Lewis, Scranton Electric Bldg.
Hancock & Willson, Mears Bldg.
Albert J. Ward, 517 Lackawanna Ave.

Sharon
Clepper & Clepper, Boyle Bldg.

Somerset
Walker & Mong, 226 E. Church St.

Stroudsburg
Harold T. Rinker & Murrel R. Kiefer, Stroudsburg National Bank Bldg.

Sunbury
Davis & Rice, Sunbury Trust Bldg.

Telford
Charles M. Talley, 314 W. Broad St.

Uniontown
H. W. Altman, Fayette Title & Trust Bldg.
Emil R. Johnson & Clarence W. Wilson, Fayette Title & Trust Bldg.

Wilkes-Barre
R. M. Herr, 140 S. Main St.
Mack & Sahm, 22 N. Franklin St.
Austin L. Reilly, Bennett Bldg.
Stanley K. Walborn, Second National Bank Bldg.

Williamsport
W. D. Schollenberger, 11 W. 4th St.
R. Douglas Steele, 34 W. 4th St.

York
F. G. Dempwolf, Cassatt Bldg.
John B. Hamme, 31 W. Market St.
Robert A. Stair, 100 E. Market St.

RHODE ISLAND

Cranston
Benjamin W. Wright, 826 Park Ave.

Pawtucket
Albert H. Humes, 332 Main St.
Monahan & Meikle, 255 Main St.

Providence
Irving S. Gorman, City Hall
Albert Harkness, Industrial Trust Bldg.
Joseph A. Hickey, 45 Oldham St.
Howe & Church, Turks Head Bldg.
William R. Walker & Son, 49 Weybosset St.

SOUTH CAROLINA

Anderson
Sam M. Cathcart, Box 73
Charles Wm. Fant, 109½ Sharpe St.

Bennettsville
H. D. Harrall, 717 W. Main St.

Clemson
Rudolph E. Lee

Columbia
J. B. Urquhart, Union Central Bldg.
Wessinger & Stork, Arcade Bldg.

Greenville
J. G. Cunningham, 100 E. Washington St.
J. E. Sirrine & Co.

Prosperity
Heyward S. Singley

Sumter
J. Whitney Cunningham, Pierson Bldg.

SOUTH DAKOTA

Mitchell
Walter J. Dixon, Woelfel Bldg.
Floyd F. Kings, Western Bldg.

Sioux Falls
Hugill & Blatherwick, Boyce Greeley Bldg.
Perkins & McWayne, Paulton Bldg.
Harold Spitznagel, Western Surety Bldg.

TENNESSEE

Bristol
R. V. Arnold, 602 Shelby St.

Chattanooga
Wm Crutchfield & H. G. Law
Wilson A. Gosnell, Volunteer Bldg.
R. H. Hunt Co.
Martin & Franklin, 806 Cherry St.
W. H. Sears, James Bldg.
Gordon L. Smith, Volunteer Bldg.

Johnson City
Coile & Cardwell

Kingsport
Allen N. Dryden, 209 Broad St.

Knoxville
Frank O. Barber, 722½ Market St.
Barber & McMurry, W. Church St.
B. F. Graf & Sons, Journal Bldg.
Manley & Young, Box 1495
Clem H. Meyer, 142 Morningside Drive
M. E. Parmelee, 400 W. Church Ave.

Memphis
George Awsumb, 1792 Forrest Ave.
W. C. Jones-W. C. Jones, Jr., Shrine Bldg.

Nashville
C. K. Colley & Son, American Bank Bldg.
Dougherty & Clemmons, Clarkston Hotel
Hart & Russell, Hitchcock Bldg.
Henry C. Hibbs, American Trust Bldg.
Granbery Jackson, Jr., Vendome Bldg.
McKissack & McKissack, Morris Memorial Bldg.
Marr & Holman, Stahlman Bldg.
Tisdale & Pinson, Independent Life Bldg.
George D. Waller, Independent Life Bldg.

TEXAS

Abilene
David S. Castle Co.

Amarillo
Guy A. Carlander, Box 3158
Rittenberry & Carder, Fisk Bldg.
J. Roy Smith, Blackburn Bldg.
Towne & Funk, Johnson Bldg.

Austin
C. G. Curtis, 300 W. 19th St.
Gieske & Harris, 207 W. 7th St.
W. E. Ketchum, 1615 S. Congress Ave.
C. H. Page, Box 937
Page & Southerland, 311 W. 7th St.
Robert Leon White, 2200 Guadalupe St.

Beaumont
Jos. C. Beck, 978 Orange St.
Wallace B. Livesay, San Jacinto Bldg.

Cisco
R. S. Glenn, 1608 Avenue H.

Corpus Christi
Hamon & Co., Sherman Bldg.
Nat W. Hardy, Nixon Bldg.

Dallas
Arthur A. Brown, Mercantile Bldg.
Ralph Bryan, Construction Bldg.
DeWitt & Washburn, Praetorian Bldg.
Korn & Sullivan, Thomas Bldg.
Mark Lemmon, Tower Petroleum Bldg.
Walter C. Sharp, Construction Bldg.
Arthur E. Thomas, Construction Bldg.

Fort Worth
W. G. Clarkson & Co., First National Bldg.
Preston M. Geren, 417 Bewley Bldg.
Earl T. Glasgow, W. T. Waggoner Bldg.
Wyatt C. Hedrick, First National Bldg.
C. M. Love & Co., 314 S. Henderson St.
W. A. Tackett & Sons, 4212 Preston St.
Elmer G. Withers Architectural Co., Inc., Mid-Continent Bldg.

Greenville
Lindsey & Kilmer, Greenville National Bank

Houston
Campbell & Keller, 3415 Austin St.
Lamar Q. Cato, M. & M. Bldg.
Henry F. Jonas & Tabor, Union National Bank Bldg.
Joseph W. Northrop, Jr., 3940 Main St.
Office of Harry D. Payne, 4301 Main St.
Henry Aam Stubee, 3908 Main St.
Maurice J. Sullivan, 4301 Main St.

Laredo
Guy A. Trout, 1801 Houston St.

Livingston
Emory S. White

Longview
M. T. Clements, c/o Voelcker & Dixon, Inc., Box 1575
Peters, Strange & Co., Glover Crim Bldg.

Lubbock
S. B. Haynes, 511 Myrick Bldg.
O. R. Walker, Palace Theatre Bldg.

Marshall
Stanley Brown

Palestine
Theo. S. Maffitt, 510 N. Sycamore St.

Paris
Will H. Lightfoot

Rosenburg
Shult & Johnson

San Angelo
John G. Becker

San Antonio
Charles T. Aubin, Smith-Young Tower
Atlee B. & Robert M. Ayres, Smith-Young Tower
Ralph H. Cameron, Box 1063
Leo M. J. Dielmann, E. Commerce St.

Marvin M. Eickenroht, Maverick Bldg.
John M. Marriott, Frost National Bank Bldg.
Morris, Noonan & Wilson, Builders Exchange Bldg.
Will N. Noonan, 801 N. Pine St.
Henry T. Phelps, Hicks Bldg.
Phelps & Dewees, Gunter Bldg.
Harvey P. Smith, National Bank of Commerce Bldg.

Sherman
John Tulloch, M & P Bank Bldg.

Tyler
Shirley Simons, Citizens Bank Bldg.

Vernon
Mike Tucker, Herring Bldg.

Waco
T. Brooks Pearson, 115 N. 12th St.

Wichita Falls
Voelcker & Dixon, Inc., 913½ Indiana Ave.

UTAH

Logan
Karl C. Schaub

Ogden
Hodgson & McClenahan, Eccles Bldg.
Eber F. Piers, 2726 Harrison Ave.

Provo
Joseph Nelson, 147 E. Center St.

Salt Lake City
Ashton & Evans, Vermont Bldg.
Scott & Welch, Dooly Bldg.
Walter E. Ware, Utah Savings & Trust Bldg.

VERMONT

Burlington
Frank Lyman Austin, 240 College St.

Rutland
Arthur H. Smith, Gryphon Bldg.

VIRGINIA

Alexandria
Brown Rolston, 302 Prince St.

Ashland
L. P. Hartsook

Blacksburg
C. H. Cowgill, Virginia Polytechnic Institute

Danville
J. Bryant Heard

Luray
Mims, Speake & Co.

Lynchburg
Hinnant & Smith
S. S. Johnson & R. C. Brannan, Allied Arts Bldg.

Newport News
Williams, Coile & Pipino, Melson Bldg.

Norfolk
Rudolph, Cooke & Van Leeuwen, Inc., Monticello Arcade

Richmond
Fred A. Bishop, 617 E. Franklin St.
Carneal, Johnston & Wright, Electric Bldg.
L. P. Hartsook & Edward F. Sinnott, 112 E. Cary St.
C. W. Huff, Jr., Builders Exchange
Raymond V. Long, State Board of Education
J. Binford Walford, 10th Street Bldg.

Roanoke
Eubank & Caldwell, Boxley Bldg.
Frye & Stone, 109 1st St., S. W.
Smithey & Boynton, 112 W. Kirk Ave.

Staunton
T. J. Collins & Son

University
Edmund S. Campbell, 55 W. Range St.
S. J. Makielski, Barracks Rd.

WASHINGTON

Aberdeen
Clarence W. George, Becker Bldg.
Charles A. Haynes, Aberdeen Savings & Loan Bldg.

Bellingham
Leonard W. Bindon, Medical Bldg.
F. Stanley Piper, Herald Bldg.
Wohleb & Stanton, Herald Bldg.

Pullman
Stanley A. Smith, State College of Washington

Seattle
Baker & Vogel, Smith Tower
C. H. Bebb & C. F. Gould, Hoge Bldg.
William Mallis, Lyon Bldg.
Earl W. Morrison, Textile Tower
David J. Myers & John Graham, Central Bldg.
F. A. Naramore, Central Bldg.
Fred B. Stephen, Smith Tower
Stimson & McDonald, Vance Bldg.
James M. Taylor, Jr., Arcade Bldg.
Arch N. Torbitt, 615 Bellevue Ave., N.

Spokane
Charles I. Carpenter, Sun Life Bldg.
G. Pehrson, Old National Bank Bldg.
George M. Rasque, Spokane Savings Bank
Rigg & Vantyne, Peyton Bldg.
Francis P. Rooney, Lindell Bldg.
Whitehouse & Price, Hutton Bldg.

Tacoma
E. J. Bresemann, Perkins Bldg.
Mock & Morrison, Perkins Bldg.
Fred G. Rounds, W. R. Rust Bldg.

Vancouver
Donald J. Stewart

Yakima
Newton C. Gauntt, R. # 6
John W. Maloney, Larson Bldg.

WEST VIRGINIA

Bluefield
Garry & Sheffey, Bailey Bldg.
Alex B. Mahood, Law & Commerce Bldg.

Buckhannon
Carl Reger, Box 27

Charleston
H. S. Kyle & J. N. Arnold, Jr., Union Trust Bldg.

Huntington
Levi J. Dean, 2748 Guyan Ave.
Wm. Francis Diehl, 1827 12th Ave.
Frampton & Bowers, 412 11th St.

Morgantown
Elmer F. Jacobs, 218 High St.

Wheeling
Frederick Faris, 1117 Chapline St.
Edward Bates Franzheim, 1425 Chapline St.

WISCONSIN

Amery
Klinger & Becker

Appleton
Raymond N. LeVee, 117 E. College Ave.
Smith & Brandt, College Ave. (also in Manitowoc)

Boscobel
Joseph G. Durrant

Eau Claire
Aloysius W. Bayer, 204 Grand Ave., E.
Carl Volkman, McGrath Bldg.

Green Bay
Foeller, Schober & Berners, 310 Pine St.
Oppenhamer & Obel, 110 S. Washington St.

La Crosse
Otto A. Merman, Gateway City Bank Bldg.
Parkinson & Dockendorff, Linker Bldg.

Madison
Law, Law & Potter, 1 S. Pinckney St.
Frank S. Moulton, 110 E. Washington Ave.
Starck & Schneider, 8 S. Carroll St.
Edward Tough, E. Washington St.

Manitowoc
Wm. J. & F. W. Raeuber, 926 S. 8th St.
Smith & Brandt, Dempsey Bldg. (also in Appleton)

Marshfield
Gus A. Krasin

Milwaukee
N. P. Backes, 3069 S. Wentworth St.
R. H. Bierman, N. 34th & Thurston Ave.
Peter Brust
Eschweiler & Eschweiler, 720 E. Mason St.
Herbst & Kuenzli, 1249 N. Franklin Pl.
Lindl & Schutte, Inc., 1025 E. Circle Drive
R. A. Messmer & Bro., 231 W. Wisconsin Ave.
Alfred H. Siewert, 2309 N. 36th St.
Thomas S. Van Alyea, 1422 E. Albion St.
Van Ryn & De Gelleke, 152 W. Wisconsin Ave.
Guy E. Wiley, 10th St. & Highland Ave.

Oshkosh
Auler, Jensen & Brown, E. R. A. Bldg.

Racine
J. Mandor Matson, 536 Baker Block

Superior
Roland C. Buck, Inc., Telegram Bldg.

Wauwatosa
Mark F. Pfaller, 8525 Ravenswood Circle

Wisconsin Rapids
Hougen & Henderson, Room 8, Wood Block

WYOMING

Cheyenne
Frederick H. Porter, Hynds Bldg.

ALASKA

Juneau
N. Lester Troast, Shattuck Bldg.

HAWAII

Honolulu
C. W. Dickey, Damon Bldg.
Ralph Fishbourne, Stangenwald Bldg.

CANADA

Calgary, Alta.
W. A. Branton, Calgary School Board, 6th St. & 4th Ave.

Edmonton, Alta.
H. Story, Public School Board Office, Civic Block

Halifax, N. S.
C. A. Fowler & Co., Capitol Bldg.

London, Ont.
C. Roy Moore & Co., 489 Richmond St.

Montreal, Que.
David R. Brown, 980 St. Catherine, W.
Alcide Chausse, 706 St. Gabriel St.
Charles David, 1440 St. Catherine, E.
J. Raoul Gariepy, 29 St. James St., E.
Henry Talbot Gouin, 10 St. James St., W.
Alfred Potvin, 750 St. Gabriel St.
Joseph Sawyer, 1207 Guy St.
C. R. Tetley, 630 Dorchester St.
Edward J. Turcotte, Dominion Square Bldg.

Ottawa, Ont.
Lucien Leblanc, 45 Rideau St.

Quebec, Que.
Pierre Levesque, 115 St. John St.

Regina, Sask.
F. H. Portnall, Credit Foncier Bldg.
J. H. Puntin, Darke Block
Van Egmond & Storey, McCallum Hill Bldg.

St. Catharines, Ont.
Lionel A. Hesson, 16 Welland Ave.

St. John, N. B.
H. Claire Mott, 13 Germain St.

Sherbrooke, Que.
Louis N. Audet, 32 Wellington St., N.
J. Aime Poulin, 63 Prospect St.

Toronto, Ont.
S. B. Coon & Son, 4 St. Thomas St.
Craig & Madill, 96 Bloor St., W.
Marani, Lawson & Morris, 46 Bloor St., W.

Vancouver, B. C.
Harold Cullerne, 325 Howe St.
Harry W. Postle, 590 Hamilton St.
Sharp & Thompson, 626 Pender St.

Welland, Ont.
Norman A. Kearns, Temple Bldg.

West Toronto, Ont.
Allward & Gouinlock, 57 Bloor St.

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CORK INSULATION CO., INC.

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FACTORY, WILMINGTON, DEL.

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Boston, Mass.
*Chicago, Ill.
Los Angeles, Cal.
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* Represented by Corinco Insulation Co., Inc.

DISTRIBUTORS IN PRINCIPAL CITIES

CORINCO CORK TILE FLOORING, WAINSCOTING AND STAIR TREADS

Corinco Cork Tile is suitable for application in

Apartments	Libraries
Auditoriums	Locker rooms
Banks	Museums
Broadcasting studios	Offices
Buses	Public buildings
Clubs	Recreational buildings
Churches	Restaurants
Elevators	Theatres
Galleries	Ships
Gymnasiums	Schools
Hospitals	Transportation vehicles
Hotels	Vaults
Homes	Vestibules

It makes a beautiful floor. The soft browns of the tile blend pleasingly with almost any color scheme or type of decoration. There is a rug-like quality to a Corinco Cork Tile floor which imparts a rich and dignified setting to any room. The different sizes and shades in which the tile is available offer the designer the opportunity to create an unlimited number of conventional and modernistic patterns, all pleasing and distinctive.

Abrasion tests have proved that it will outwear the average hardwood floor and will last for years without replacements.

Corinco Cork Tile possesses unusually high insulating qualities; is warm in winter and cool in summer. Its resiliency provides ease in walking or standing and does away with the shocks which cause fatigue at the close of the day.

Manufactured from pure cork it is a natural insulation against noise and vibration. It neither reflects nor amplifies noise but absorbs it; a quality which recommends its use particularly where quiet is essential.

Whether wet or dry and highly polished, a Corinco Cork Tile floor offers sure footing, thus helping to prevent accidents often due to slippery floors. It is a safe floor to walk on and in addition is a fire retardent and will not support combustion.

A Corinco Cork Tile floor is impervious to moisture. It can be easily cleaned by washing with non-caustic soap and water without harm. It takes a high polish readily. We furnish a special Corinco Cork Tile Floor Polish for this purpose.

The cost of Corinco Cork Tile installed compares very favorably with the cost of any good grade of resilient flooring. Their long life and wearing qualities, combined with the low cost of upkeep, make Corinco Cork Tile floors more economical in the long run.

Colors, Weights and Sizes

Corinco Cork Tile is made in mottled light, medium and dark shades of brown. It is available in 3/8" (approximately 20 oz. per sq. ft.) and 9/16" (approximately 33 oz. per sq. ft.) thicknesses, and in greater thicknesses on special order.

Heavy density tile, which can be furnished on special order, has a weight approximately 10% more than the regular weights mentioned here. Heavy density tile is furnished in mottled medium shade of brown only.

Corinco Cork Tile is available in the following standard sizes and in suitable widths for borders:

12" x 12"	4" x 4"	9" x 9"	6" x 18"
12" x 18"	3" x 18"	8" x 8"	4" x 12"
12" x 36"	6" x 12"	6" x 6"	12" x 24"

Special sizes can be furnished where required.

Corinco Cork Tile Cove and Base, Wainscoting and Stair Treads

Corinco Cork Tile Cove and Base is manufactured in one piece for either 3/8" or 9/16" thickness of tile in two types with top edge square for flush wall finish or rounded to fit over wall surface. Corinco Cork Tile Wainscoting is available in sheets either 3/8" or 9/16" thick. Installed with Corinco Cork Tile Cove and Base this forms a beautiful wall surface which is both durable and hygienic.

We furnish a special heavy density Cork Tile Stair Tread with Nosing which can be installed with water proof cement to either wood, metal or concrete sub-flooring. The risers to complete the stairs are furnished with Cork Tile either 3/8" or 9/16" in thickness.

Installations and Specifications

Installations are made by experienced workmen and are guaranteed against ordinary wear and tear. We will gladly furnish specifications, plans and estimates upon request.

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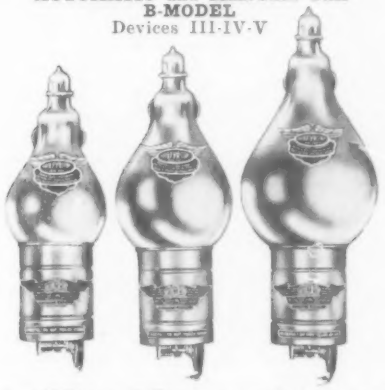

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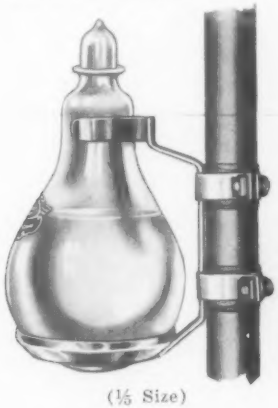

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